**SUMMARY OF PROFESSIONAL ACCOMPLISHMENTS**

**1. First and last name:** Iwona Aneta Jelonek

**2. Diplomas and Academic/Artistic Degrees – with the name, place, and year of acquisition and the title of the doctoral dissertation.**

2002 – 2006 – PhD studies at the University of Silesia at the Faculty of Earth Sciences
The title of the doctoral dissertation: "Facies development of the No. 207 seam from the Łaziska Beds in the "Jaworzno" coal mine (Upper Silesian Coal Basin)".
PhD in Geology obtained in December 19, 2006.

1997 – 2002 – Master's studies at the University of Silesia at the Faculty of Earth Sciences
Field: Geology. Specialization: Individual organization of studies
Master of Science Exam in photography passed with the following grade: A
Master's Thesis title: Carbonaceous matter derived from unburned reactive coal macerals found in the fly ash from the "Katowice" power station

2014 – 2015 – Postgraduate Studies at the Poznan School of Banking, Faculty in Chorzów. A diploma in Research and Development Project Management (grade: A) obtained in June 6, 2015.
Thesis title: "Quality management on the example of the production process of eco-pea coal.

**3. Information on previous employment in academic units.**

*PROFESSIONAL EXPERIENCE:*
2008 – up to now employed as: Assistant Professor at the Department of Geochemistry, Mineralogy and Petrography at the University of Silesia
2006 – 2007 employed as: scientific and technical employee at the University of Silesia
*FUNCTIONS PERFORMED:*
2016 – up to now: appointed by the Marshal of the Silesian Voivodeship (Order No 33/2016 of 23 May 2016) as a Member of the Working Group for reducing low-stack emissions in the Silesian Voivodeship.
2015 – up to now. Member of the Board at SPIN-US Sp. z o. o.
2015 – up to now - appointed by the Rector of the University of Silesia as the Coordinator for Cooperation and as the Coordinator for Apprenticeships and Traineeships under the Framework Agreement for Cooperation signed between the University of Silesia in Katowice and Tauron Group (Tauron Polska Energia S.A.).
2014 – up to now: appointed by the Dean of Earth Sciences as the Faculty's Representative for Commercial Affairs. The representative's responsibilities include ongoing cooperation

with the Centre for Research and Industry Cooperation, that is reviewing and detecting promising research results for implementation.
2014 – up to now: appointed by Dariusz Laska, the director of the Centre for Research and Industry Cooperation at the University of Silesia as the Centre for Research and Industry Cooperation consultant on the HORIZON 2020 implementation projects and other European Commission projects.
2014 – up to now: appointed by President Katarzyna Papież-Pawełczak as the SPIN- US Limited Liability Company consultant on steel and coal, involved in the processes of commercialization of research results managed by the SPIN- US Limited Liability Company pursuant to the Art. 86 of the Law on Higher Education.

**4. The achievements ∗pursuant to Art. 16 paragraph 2 of the Act of 14 March 2003 on Academic Degrees and Titles and on Degrees and Titles in Arts (Dziennik Ustaw (Journal of Laws), 2003, No. 65, item 595, as amended):**

*a) The title of scientific achievement*

## Petrographic studies as an innovative indicator of knowledge in the process of evaluating the accuracy of forecasting the quality of solid fuels and organic matter

*b) (author/authors, title/titles, year of publication, name of publisher)*

***Leading publications:***

**[I-1]** Iwona Aneta Jelonek, Krystyna Jadwiga Kruszewska, Stanislav Czudek, Maria Angeles Gómez Borrego, Alena Kožušníková, Heike Liszio, and Erwin Zmuda. 2015: Improvement of coal carbonization through the optimization of fuel in coking coal blends. Luxembourg: Publications Office of the European Union, 2015, ISBN 978-92-79-52025-9, doi:10.2777/46767, Pages: 156.
*The Habilitation Candidate's share: 35%*

**[I-2]**Jelonek I., Mirkowski Z. 2015: Petrographic and geochemical investigation of coal slurries and of the products resulting from their combustion. International Journal of Coal Geology, Volume 139, 1 February 2015, Pages 228-236.
*IF (2015) = 3.381, 35 points from the Ministry of Science and Higher Education according to the criteria as of 31.12.2014*
*The Habilitation Candidate's share: 50%*

**[I-3]**Morga R., Jelonek I., Kruszewska K., Szulik W. 2015: Relationships between quality of coals, resulting cokes, and micro-Raman spectral characteristics of these cokes.

∗ in the case of joint publications, provide a declaration of all its coauthors, determining their individual share.

International Journal of Coal Geology, Volumes 144–145, 1 May 2015, Pages 130–137.
*IF (2015) = 3.381; 35 points from the Ministry of Science and Higher Education according to the criteria as of 31.12.2014*
*The Habilitation Candidate's share: 35%*

**[I-4]** Morga R., Jelonek I., Kruszewska K. 2014: Relationship between coking coal quality and its micro-Raman spectral characteristics. International Journal of Coal Geology, Volume 134-135, 15 November 2014, Pages 17–23.
*IF (2015) = 3.381; 35 points from the Ministry of Science and Higher Education according to the criteria as of 31.12.2014*
*The Habilitation Candidate's share: 35%*

**[I-5]** Sławomir Kędzior, Iwona Jelonek. 2013: Reservoir parameters and maceral composition of coal in different Carboniferous lithostratigraphical series of the Upper Silesian Coal Basin, Poland. International Journal of Coal Geology, Volumes 111, Pages 98–105.
*IF (2015) = 3.313; 35 points from the Ministry of Science and Higher Education according to the criteria as of 31.12.2013*
*The Habilitation Candidate's share: 50%*

**[I-6]** I. Jelonek, K. J. Kruszewska, P. Filipiak. 2007: Liptinite as an indicator of environmental changes during formation of Coal seam No. 207 (Upper Silesia, Poland). International Journal of Coal Geology, Volume 71, Pages 471 – 487.
*IF (2015) = 1.625; 35 points from the Ministry of Science and Higher Education according to the criteria as of 31.12.2014*
*The Habilitation Candidate's share: 50%*

**[I-7]** Mirkowski Z., Jelonek I., Bierut B. 2010: Comparative analysis of qualified steam coal from Kazimierz–Juliusz Coal Mine and Juliusz Plant on the basis of physicochemical and petrographic studies. Bulletin of the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, Kraków, No. 79, pp.315-327.
*The Habilitation Candidate's share: 40%*

**[I-8]**Jelonek I., Mirkowski Z., Iwanek P. 2010: Physical-chemical properties of coal slurries in aspect of their use on example of PKE S.A. selected object. Przegląd Górniczy, No. 10, pp.156-160.
*9 points from the Ministry of Science and Higher Education according to the criteria as of 31.12.2010*
*The Habilitation Candidate's share: 40%*

**[I-9]**Iwanek P. Jelonek I., Mirkowski Z. 2008: Preliminary research on fly ash from the fluidal boiler in the context of its development. Mineral Resources Management, Volume 24, Issue 4/4, pp.91-104.
*10 points from the Ministry of Science and Higher Education according to the criteria as of 31.12.2007*

*The Habilitation Candidate's share: 40%*

***Other reviewed publications:***

**[I-10]** Kruszewska K., Jelonek I., Czudek S., Hermann R. 2013: Interrelation between petrographic and coking properties of coal. Metallurgical Journal, vol. LXVI- 1/2013, Pages 5-12.
*The Habilitation Candidate's share: 40%*

**[I-11]** Czudek S., Herman R., Jelonek I., Kruszewska K. 2011: Research of Relationship between Petrographic Coal Constitution and Corresponding CSR/CRI Parameters of Coke. Metallurgical Journal, vol. LXIV- 5/2011, Pages 3-6.
*The Habilitation Candidate's share: 45%*

**[I-12]** Jelonek I. 2009: Preliminary results of the use of fluorescence for determining macerals from the liptinite group on the example of coals from the No.325 and 325/1 in the KWK Bolesław Śmiały coal mine (Upper Silesian Coal Basin). Documenta Geonica 2009/2 Academy of Sciences of the Czech Republic, Ostrava 2009, pp. 61-71.

**[I-13]** Jelonek I., Mirkowski Z., Antoszczyszyn T. 2009: Characteristics of coal from the roof of the No. 507 seam (Middle Namurian) in the ZG „Siltech" mining area in Zabrze. Materials of the XXXII Symposium: Geology of coal-bearing formations of Poland, organised by the AGH University of Science and Technology in Kraków, 2009, pp. 15-18.
*The Habilitation Candidate's share: 45%*

**[I-14]** Jelonek I., Mirkowski Z., Antoszczyszyn T. 2008: Petrographic and qualitative investigations of the coal seam No. 509 (middle Namurian) from the "Siltech" mine (Zabrze) in the Upper Silesian Coal Basin. Materials of the XXXI Symposium: Geology of coal-bearing formations of Poland, organised by the AGH University of Science and Technology in Kraków, 2008, pp. 9-13.
*The Habilitation Candidate's share: 45%*

*Total Impact Factor of the mentioned publications is **15.081****
** based on available IF 5 for 5-year periods including the year of publication.*
*Total points from the Ministry of Science and Higher Education (as of 2015) for the mentioned publications is - **194***

*c) Presentation of the scientific aim of the paper/papers, the obtained results and their possible use.*

My research activity focuses on the organic petrology of fossil fuels. The presented scientific achievement refers to the selected projects managed by me in the years 2007-2015. The scope of works included bituminous coal, coal slurries, unburned organic matter found in ashes from power plants, and metallurgical coke. A wide range of petrographic analyses, including reflectance measurements, maceral, and microlithotype analysis,

provided many details on the quality of fuels, estimation the quality of metallurgical coke, and the efficiency of combustion processes in relation to the content of organic matter present in the ashes and slags generated as a result of coal, bio fuels, or coal slurries combustion.

The main aim of the presented scientific achievement, presented in a series of publications, is to provide information on the optimal choice of methods used in the petrology of organic matter.

The primary goal was to develop, and implement on an industrial scale, a new method for forecasting the quality metallurgical coke, based on petrographic properties of coking coal. The method is based on reflectance measurements of all macerals, which allows to separate the reactive and inert part of coal and to estimate the Coke Strength after Reaction (CSR) and the reactivity of coke (CRI).

Petrographic parameters of coal form the basis for international industrial codification systems and the geological classification of coal developed by the European Economic Commission of the United Nations [1]. It is well known that in addition to physical and chemical properties of coal, the microscopic composition of coal, including the maceral analysis, and the intensity of light reflection from the surface of vitrinite - more precisely collotelinite (coal rank) are crucial to determine the behaviour of coal during the process of coking while the petrographic composition affects the quality of the projected coke [2], [3], [4], [5], [6], [7]. The vitrinite reflectance is considered as one of the most accurate methods for determining the type of coal [8]. In Poland, the current classification of coal (the PN-82 / G-97002 standard) [9] is based on average values of physical and chemical parameters, without going into the unique properties of coal macerals. The classification does not take into account the variable reactivity of macerals from the inertinite group, where the division into inert and reactive components depends primarily on the variable intensity of reflectance, as documented and presented in the presented work **[I-1; I-10; I-11]**.

In the presented series of works, the first one **[I-1]**, is focused on studies related to the quality of metallurgical coke (CSR and CRI), which depends to a major extent on the properties of coal subjected to the coking process **[I-10; I-11]**. Generally, the lack of fast and modern methods for forecasting the quality of metallurgical coke has resulted in the need to study this issue within the framework of the RATIO-COAL project [**I-1]**. As a result, coals from different regions of Europe, Canada, and South Africa and alternative fuels have been tested. Granules made from car tires and waste resulting from the production of electronic chips and polyethylene were used as alternative fuels. To develop new and effective approach to forecasting the quality metallurgical coke, two key aspects were taken into account: a careful selection of individual coals provided by the Zabrze coke plant (Kombinat Koksochemiczny Zabrze) and Třinec Iron and Steel Works (Třinecké Železárny), and the choice and use of the widest possible range of assessment methods, which were divided into six steps / tasks.

In the first stage, 77 individual coals with different ranks have been tested in order to select the best blends for further testing on an industrial scale. Coal samples were subjected to the analysis of moisture content, ash content, volatile matter, sulphur content, chlorine content and phosphorus content. Other parameters, including Roga Index RI, Swelling Index SI, Gieseler index, contraction and dilatation have also been investigated. In addition, petrographic analysis, including maceral analysis, microlithotype analysis, reflectance measurement of all macerals, measurement of relative fluorescence, porosity measurement using the mercury porosimeter and image analysis, Raman spectroscopy, mineralogical characterization of the selected samples, and qualitative and quantitative analysis of mineralogical and thermo-gravimetric analysis TG - DTA have been performed. Then, coal samples were coked in the so-called "box samples" introduced to the coke battery in the Zabrze coke plant and Karbotest device in the Třinecké Železárny. The obtained coke samples were subjected to the analysis of moisture content, ash content, volatile matter, sulphur content, chlorine content, and phosphorus content. In addition, CRI (reactivity to CO2) and CSR (Coke Strength after Reaction) were evaluated.

On the basis of physicochemical analysis carried out for individual coal samples it has been shown that out of 77 coal samples 57 are coking coals, 14 has high volatile content, making them suitable for coal blends, while 6 samples were classified as free-burning coal, which may be used during the coking process. The ash and moisture contents were below 12% (while ash content of up to 33% was observed only for the South African coal). The results of the technical analysis fall within the scope of coking coals.

All of the discussed petrographic methods, including light reflection from the surface of vitrinite, vitrinite measurements of all macerals (to determine the rank of coal: ReScan), and the sum of the reactive macerals calculated from scanning (ΣReScan), are the most accurate, reliable and technically suitable for industrial needs. An additional advantage of using petrographic methods in the form of the Scan is that it can be performed simultaneously with vitrinite reflectance measurements and does not require special training for the operator or additional equipment. Another important aspect of the above-mentioned method is the fact that a thorough division between the reactive and inert macerals in a given coal can be performed using the average intensity of light reflection from the surface of all macerals and the histogram boundary separating the reactive and inert part of coal. When it comes to maceral analysis, typically used for determining the quality of coal, it became clear that maceral groups from one sample, in a more or less broad reflectance spectrum, usually coincide with each other. This situation is particularly evident during the analysis of coal blend samples. In addition, the reactivity of the individual macerals depends on the reflectance of individual particles and not on their maceral groups. It should be stressed that the maceral analysis, unlike reflectance measurements, is obtained by subjective human eye evaluation, which makes it less reliable.

Another methods used in the project are useful for assessing the quality of coal blend in cases of doubts. Microlithotype analysis has shown its usefulness in the assessment of the size of inert particles size in the sample and the proportion between macerals, providing

information on the depositional environment of the tested coals. The relative fluorescence intensity measurements have proven to be complicated and too expensive for routine use in the industry, but may be useful for the evaluation of coal liquefaction. The measurement of coal porosity has shown that vitrinite group is most susceptible to cracking out of the three maceral groups. Thermogravimetric analysis has proven useful in the evaluation of melting properties of inertinite present in both low and high rank coals.

The above discussion has shown that the most appropriate methods to be used when selecting coals for coking (together with basic physical and chemical analyses) are petrographic analyses including scanning of all macerals (expressed by their reflectance) combined with measurements of the vitrinite reflectance.

In the next phase, the obtained results of all analyzes were subjected to advanced statistics, which eliminated the need for the majority of analyses and confirmed the validity the validity of the variable in the form of ΣReScan. A formula for estimation of coke quality, which was used in the next stage of the project, has been developed.

CSR = -73.67136526(11.01849877) + 2.044260318(0.1763379408) * ∑ReScan

CRI = 113.5008376(11.53388797) – 1.247094148(0.184561307)* ∑ReScan

In the next stage of the project, coal blends, coked in the so-called "box samples" introduced to the coke battery and Karbotest device analogously to individual coals, were composed. In total 27 coal blends were composed (16 mixtures by the Zabrze coke plant and 11 mixtures prepared by Třinecké Železárny, a.s.). The obtained coal blends and cokes were subjected to a set of physico-chemical, technical, and petrographic analyses. The Scan of coal blends along with calculation of the ΣReScan have been performed before the coking process in order to check the accuracy of forecasting the quality of coke based upon the CSR and CRI values. The statistics allowed identifying the dependent variables in the prepared formula for forecasting the quality of coke, which has shown high correlation coefficients for CSR (0.92) and CRI (0.82). The obtained results were successful in showing the expected small difference of up to 4.5 points between the estimation of the quality of coke (CRS and CRI) based on a scan of all macerals in the coal blend and the standard method (Nippon Steel Corporation). The collected data allowed the development of a formula for forecasting the quality metallurgical coke resulting in the *know-how* license between the University of Silesia and Třinecké Železárny, a.s.

In the last stage of the project, 15 sets of coal blends, 120 tonnes each, were prepared and subjected to a two-stage coking process on an industrial scale in Třinecké Železárny, a.s. The forecast of coke quality is performed after the scan of each formulated coal blend. The difference between the estimation of CSR and CRI and the obtained value after coking is up to 2 points. The correlation coefficient for CSR and CRI is 0.971 and 0.958, respectively which indicates the accuracy and appropriateness of the method based on the petrographic analysis.

To sum up **[1]**:The developed innovative petrographic method will be used in order to precisely determine the proportion of reactive components in coal blends and will contribute to fast and accurate estimation of the quality of the obtained metallurgical coke needed to

produce high-quality steel. The obtained research results based on the petrographic analysis are of use in the steel and coke industries considerably reducing costs associated with the production of coke and - as a consequence - steel prices. In addition, the aforementioned results can be used by parent business units and academic institutions, forming a basis for petrographic studies of coal and its use. I wish to emphasize that the project has been successfully completed within the prescribed period in accordance with the grant agreement and approved by the European Commission while the results were reviewed and published by the Publications Office of the European Union in 2015 and are currently being implemented on an industrial scale in the Třinec Iron and Steel Works (Třinecké Železárny, a.s).

Particular attention should be given to the Raman spectroscopy **[I-1; I-3; I-4]**, which can be used as a supporting tool for petrographic methods in the future thanks to the significant statistical relationships between petrographic parameters, including the Scan of all macerals expressed in the degree of reflectance (ReScan), vitrinite reflectance (Rr ), liptinite content, mineral matter content, and Raman parameters: 1) the half-width of the G band and the volatile content (Vdaf) (r=0.94), the ReScan (r=-0.92) and the Rr (r=-0.74); 2) the position of the D1 band and the Free Swelling Index (SI) (r=-0.75), the Roga index (RI) (r=-0.72), the volatile content (Vdaf) (r=-0.87), the ReScan (r=0.82), the Rr (r=0.90), the liptinite content (r=-0,87) and the mineral matter content (r=0.83); 3) the half-width of the D1 band and the volatile content (Vdaf) (r=0.74) and the ReScan (r=-0.71); 4) the position of the D4 band and the volatile content (Vdaf) (r=-0,75) and the ReScan (r=0,73); 5) the quotient of AD2/AALL and the Free Swelling Index (SI) (r=0.91) and the mineral matter content (r=0.81). In addition, important dependencies between physical-chemical parameters and Raman parameters have been found. These include relationships between: 1) the position of the D2 band and the Free Swelling Index (SI) (r=-0.89) and the Roga index (RI) (r=-0.75); 2) the position of the G band and the Free Swelling Index (SI) (r=-0.78); 3) the quotient of AD4/AALL and the volatile content (Vdaf) (r=-0.75); 4) the quotient of ID2/IG and the Free Swelling Index (SI) (r=0.87).

The interpretation of the above mentioned dependencies between petrographic parameters of coal (vitrinite reflectance and reflectance of all macerals, the so-called ReScan), and Raman parameters allows for the following considerations: 1) the half-width of the G band is one of the measures of the arrangement of the internal structure. The degree of arrangement of the internal structure increases along with the decreasing width of the G band. It has been found that this parameter is correlated with the volatile matter content, thus confirming that the higher the volatile content, and hence the lower the rank of coal, the lower the degree of arrangement of the internal structure. The half-width of the G band is inversely correlated for the average reflectance of the ReScan coal components and therefore is less dependent on the average vitrinite reflectance Rr. the higher the ReScan reflectance and/or vitrinite reflectance Rr, the higher the degree of arrangement; 2) The half-width of the D1 band, similarly to the half-width of the G band is

used as a measure of the internal structure arrangement. The dependence on volatile content and the ReScan confirms the conclusions from the previous paragraph; 3) The relationship between the position of the D1 band and reflectance parameters (ReScan, Rr) confirms that in the case of coals from the tested range of coalification the D1 band shifts towards higher wavenumbers along with the increasing reflectance (ReScan, Rr). The higher the wave number of the D1 band, the less favourable technological coking properties (lower SI and RI). In turn, the relationship between petrographic parameters and coking leads to the following conclusions: 1) The less favourable coking properties (lower SI), the higher the wave number of the G band; 2) The ID2 /IG ratio is inversely proportional to the height of aromatic layers (crystallites) (Lc) in coal [10, 11, 12, 13 and 14]. This parameter is correlated with the Free Swelling Index (SI). Hence, they higher the ID2 / IG ratio, i.e. the lower the amount of aromatic layers, the better coking properties of coal.

To sum up**[ I-1, I-3, I-4]**: On the basis of statistically significant relationships between: Raman spectroscopic parameters and chemical-technological parameters and physical properties of coking coal, Raman spectroscopic parameters of coking coal and chemical-technological and mechanical parameters of the produced coke, and Raman spectroscopic parameters and chemical-technological parameters and physical properties of coke, three basic conclusions can be drawn: 1) The Raman spectroscopy is a useful tool for estimation of the selected chemical-technological properties of coking coal (SI, RI and Vdaf) and chemical-technological and mechanical parameters of coke (Vdaf, CRI and CSR); 2) On the basis of Raman spectroscopic parameters of coking coal it is possible to predict the selected chemical-technological and mechanical properties of the produced coke (Vdaf, CRI, and CSR); 3) Petrographic studies correlated with Raman parameters provide valuable information on the quality of coking coals and the produced cokes.

The next two papers **[I-2; I-8]** demonstrates how practical and purposeful is the use of petrographic analyzes for coal slurries and fine coal used in the power industry. The subject matter of the presented paper concerns coal slurries, which are usually viewed as a by-product resulting from the processing of bituminous coal This type of waste, until recently, was deposited in settling tanks, landfills or dumping grounds A change in approach to this group of waste took place with the introduction of fluidized bed boilers into the commercial power industry The air circulation in CFBC (Circulating Fluidized Bed Combustion) boilers, affecting deposit layers in the boiler chamber, enables proper mixing of coal slurries (in amounts ranging from 17% to 40%) and coal fines while maintaining the optimum proportions so as to maintain the stability of the combustion process and achieve the desired effect.

In the course of the study, **[I-8]** coal slurries and coal from the same supplier, as well as unburned organic matter found in ashes resulting from their combustion, were subjected to a detailed analysis. Petrographic examination, including the maceral analysis, has shown that coal slurries are characterized with the highest content of macerals from the inertinite group ranging from 48.6% to 55.2%. The macerals from the vitrinite and liptinite

groups were ranging from 35.4% to 42.6% and 2.8% to 5.2%, respectively. In the case of coals from the same supplier, the most common are macerals from the vitrinite group, followed by macerals from inertinite and liptinite (the lowest share as in the case of coal slurries) groups. Another very characteristic feature is that coal slurries are dominated by detrital macerals like inertoderinite, vitrodetrinite, and liptodetrinite, reaching up to 71.2% compared to the analyzed coal amounting up to 20.4%.

In the**[I-8]** paper, an analysis of unburned organic matter occurring in industrial ashes has been performed. The identification of the unburned organic matter has used the classification proposed by Mrs. PhD. Magdalena Misz-Kennan [14]. To sum up **[I-8]**: The maceral content of coal slurries differs from the maceral content of burned fine coal. The difference is that coal slurries are dominated by macerals from the inertinite (at the expense of the liptinite group) and fine coal from the same supplier is dominated by macerals from the vitrinite group. Moreover, the analyzed coal slurries are dominated by detrital macerals which suggests mechanical grinding of the material. Meanwhile, smaller amounts of liptinite are likely to contribute to the lower hydrogen content (2.6 ÷ 3.2%) which in turn results in the reduced calorific value of coal slurries. However, grinded material can improve the combustion process. The analyzed forms of unburned organic matter in ashes resulting from the combustion of coal slurry - coal blend suggests significant dominance of detritus and this in turn suggests a clear thermal degradation of organic matter triggered by the circulation in fluidized bed boiler.

The **[I-2]** paper has focused on coal slurries from different mines, burned in the Tauron Wytwarzanie S.A. power plants. The analyzed coal slurries resulted from the enrichment of coal from coal seams in the Namurian and Westphalian formations of the Upper Silesian Coal Basin. Coals from the Upper Silesian Coal Basin are characterized by a high content of macerals from the vitrinite group (55-75%), while the content of macerals from the inertinite and liptinite group is up to about 30% and below 20%, respectively [15]. The maceral content of the analyzed coal slurries is significantly different than in case of typical coals from the USCB. A characteristic feature is the high content of macerals from the inertinite group. An analysis of the share of individual macerals performed on the selected samples has shown the dominance of inertodetrinite, reaching up to 50%. When it comes to other macerals from the inertinite group, the occurrence of semifusinite (9.0%) and micrinite (to 4.0%) has been confirmed. The share of other individual macerals from the inertinite group was below 1.0%. It is clearly visible that the share of macerals from the inertinite group increased mainly at the expense of macerals from the vitrinite and - to some extent - liptinite group. Similar tendencies were found in coal slurries from coal processing plants in the US, although such high contents of inertinite have not been observed [16]. In the case of macerals from the vitrinite group, the largest share is observed for vitrodetrinite (25%), collotelinite (15%), and collodetrinite (up to 9.0 %). The share of macerals from the liptinite group ranged from 3.0 to 5.5%. In this group, only two macerals have been found: liptodetrinite (3.0%) and sporinite (3.0%). When analyzing the share of individual macerals from the inertinite, vitrinite, and liptinite group in the samples of coal slurry, the high

content of detrital macerals, in the range of from 68.1% to 82.5%, can be observed.

For comparison purposes, petrographic analysis of coals subjected to enrichment process (the analysed samples of coal slurries were obtained as a result of coal washing) has been performed. The share of macerals from the inertinite group is about two times lower than in the case of coal slurry samples and is accompanied by an increased content of macerals from the vitrinite and liptinite group. In addition, the detrital macerals content, ranging from 31% to 56%, is considerably lower. Collodetrinite and vitrodetrinite dominate among the detrital macerals, while the share of inertodetrinite reaches up to 11%. The analysis of coal samples has also confirmed the occurrence of all typical humic macerals. In contrast, in the case of coal slurries a lot of macerals have not been found or occurred only in trace amounts. Instead of being used as stand-alone fuels in power plants, coal slurries are blended with coal in amounts of up to 50% before being fed to boilers. Petrographic examination of ash resulting from the combustion of a mixture of coal and coal slurries has shown a high content of mineral matter (81.0 - 94.0%), which indicates a good afterburning of coal in the fluidized bed boiler. Unburned organic matter is dominated by detritus, that is small (less than 10 microns) grains resulting from the fragmentation of other forms. Particularly high detritus content has been found in the fly ash, which is associated with elevation of the smallest ash components by exhaust gases. Meanwhile, it is difficult to clearly determine whether the high content of detrital macerals in coal slurries contributes to the high content of detritus in the ash. The examination of ash from fluidized bed coal-fired boilers (without the addition of coal slurries) indicate significantly lower share of detritus in the fly ash (5.8 - 7.6%) and bottom ash (0.0 - 2.0%). These results can confirm the above-formulated hypothesis. However, confirmation of this observation would require further analysis on a larger number of samples. In the case of fly ash, other forms of unburned organic matter have not been found or occurred only in trace amounts. A greater, although still low, diversity of forms of unburned organic matter has been found in bottom ashes. In the majority of samples thin-walled and thick-walled cenospheres, thin-walled and thick-walled laces, and residues after macerals from the inertinite group (both massive forms and inertoids) have been identified. The high content of inertinite in coal slurries has not resulted in an increased share of the massive forms and inertoids in ash. On this basis it can be concluded that coal slurries were dominated by reactive macerals from the inertinite group.

To sum up **[I-2]**: A characteristic petrographic feature of coal slurries is a high content of macerals from the inertinite group, significantly exceeding the typical content for coals from the North Atlantic province. Macerals from the inertinite group are dominated by inertodetrinite. Detrital minerals are also dominant among the macerals from the vitrinite and liptinite groups. The high content of inertinite in coal slurries can contribute to increased amounts of unburned organic matter in ash. However, limited amounts of massive forms and inertoids in ash suggest the dominant share and good combustion properties of reactive macerals from the inertinite group. Unburned organic matter in ash is dominated by detritus, which in part may be due to the high content of detrital macerals in coal slurries.

The **[I-7]** paper compared the petrographic and physicochemical properties of eco-pea coal from the KWK Kazimierz-Juliusz coal mine ("Eko-Kazimierz") and Juliusz Plant ("Ekoret") and tested the products of their combustion in the retort furnace. When it comes to physical and chemical parameters, including the calorific value, which is a desirable parameter for users of eco-pea coal, "Ekoret" has more favourable parameters. Unfortunately, at the same time disadvantage it is characterized by high sinterability, which is unfavourable due to sinters resulting from the combustion process. Meanwhile, „Eko-Kazimierz" has more favourable parameters when it comes to ash and sulphur content. The petrographic analysis has provided valuable data on the rank of coal and the content of reactive and inert macerals occurring in coals used in the production process of is eco-pea coal. The rank of coal is well correlated with the sinterability due to the fact that the higher the rank of coal, from which "Ekoret" is produced, the higher the sinterability. Consequently, the higher the rank of coal, the lower the moisture content and the higher the calorific value, which has been observed in the "Ekoret". The maceral analysis has confirmed a large variability of the examined eco-pea coals. In the "Eko-Kazimierz" eco-pea coal, macerals from the vitrinite and inertinite group are present in equal proportions. In addition, their liptinite content is higher when compared to "Ekoret" eco-pea coal. The "Ekoret" has a high inertinite content (51%) compared to the "Eco-Kazimierz" eco-pea coal (38.4%). The petrographic analysis of unburned organic matter present in by-products including fly ash resulting from the combustion of eco-pea coal has shown no significant differences. However, these differences have been confirmed in coal slurries resulting from the combustion of "Ekoret" eco-pea coal, characterized by an increased content of unburned organic matter. In order to eliminate any errors the tests were repeated four times in retort furnaces from different manufacturers.

To sum up **[I-7]**: Based on the petrographic composition and physico-chemical properties, the high content of reactive macerals (vitrinite, liptinite) occurring in the "Eko-Kazimierz", accompanied by lower sulphur and ash content, is favorable for the process of combustion. Meanwhile, the high content of inert macerals and increased sinterability lowers the efficiency of boilers and negatively affects the combustion process. When it comes to the high content of unburned organic matter present in coal slurries formed after the combustion of "Ekoret" eco-pea coal, it is most likely due to the higher sinterability, which is affected by, inter alia, the rank of coal. The resulting sinters cannot be burned in the retort furnace. In addition to the required quality of eco-pea coal, boiler parameters also very important and must be adapted the used eco-pea coal.

The **[I-9]** paper has focused on the analysis of content of morphological forms of unburned organic matter from power plants ashes. Based on these results, it has been found that detritus is the only common form in the ash. Its relatively high content of around 80% is the result of capturing soot and small particles, contained in the exhaust gas stream, in the electrostatic precipitator

The lower content of morphological forms (12% to 22%), with the most common form of detritus (up to 20%), has been observed in bottom ashes. The increased content of detritus

in bottom ash is a prerequisite for efficient combustion process in the described system. As a result of the turbulent combustion process and long residence time of fuel particles in the furnace, greater morphological forms are crushed and appear in this form. The increased detritus content in the ashes can be explained by the specific maceral composition of the co-burned coal slurries. As a result, large amounts of the potentially inert maceral, that is inertodetrinite (up to 47%), can be found in the furnace. The content of massive forms ranges from 0.2 to 4%. Morphological forms (their precursor is reactive fuel material) are present in the tested the ashes in much smaller quantities. The cenosphere and lace content is in the range from 0.2% to 3.6%, and 0.2% to 3.8%, respectively. A marginal content of mixed forms and honeycombs (0.2% to 0.6%) has been confirmed. The effective combustion of fuels has also been confirmed by the low level of combustibles in ash (from 0.85% to 1.94%) and elemental carbon (from 0.54% to 0.76%).

To sum up **[I-9]**: The analysis of unburned organic matter found in ashes from power plants provided data on the quality of burned coal and allowed rational planning of the future coal supplies in order to maintain the most efficient combustion of coal in the commercial power industry. This is another example of the validity of petrographic analyses of fly ash and bottom ash resulting from the combustion of fossil fuels.

The next paper **[I-5]** presents the use and usefulness of the petrographic analysis of methane resources in coal seams in the Upper Silesian Coal Basin. The assessment of reservoir parameters has taken into account the porosity, permeability and petrographic analysis, including the content of individual macerals and the coal rank of the tested coals. On the basis of the analysis it has been found that the highest values for reservoir rocks were obtained in the youngest Cracow Sandstone Series, where coals are enriched in macerals from the vitrinite group. In contrast, in the oldest Paralic series, both the vitrinite content and reservoir parameters are significantly decreased. Coals enriched in macerals from the vitrinite group are characterized by higher permeability than coals rich in macerals from the inertinite group. This is probably due to the fact that the vitrinite layers occurring in bituminous coal seams are prone to crushing. It should be noted that no clear relationship between the porosity and the maceral composition of coal has been shown. The variability of reservoir parameters of coal is also dependent on tectonic stresses resulting in closing of natural cracks and thus reducing the permeability in the vicinity of large tectonic zones. The Bzie-Czechowice zone, with increased permeability of coal, can serve as an example.

To sum up **[I-5]**: The permeability and effective porosity of coal are crucial for the assessment and extraction of methane from coal seams. Meanwhile, petrographic parameters provide valuable information on the characteristics of reservoir properties, as they affect the quality/accuracy and reliability of results. The petrographic analysis carried out has confirmed that the coals belonging to the Cracow sandstone series (Upper Silesian Coal Basin), rich in macerals from the vitrinite group, can undoubtedly serve as a very good methane carrier when the geological conditions are overcome.

The next papers **[I-6], [I-12], [I-13], [I-14]** examined the quality of coals from the No. 207

seam, the Cracow Sandstone Series, the No. 325 and 325/1 seam from the Mudstone Series, and the No. 507 and 509 seam from the Upper Silesian Sandstone Series in terms of their potential use and in order to restore the depositional environment. A total of 299 samples were selected for petrographic examination.

In the No. 207 seam **[I-6]** has been subjected to the following analysis: the determination of coal rank, maceral analysis, microlithotype analysis, and palynological analysis. Observations and measurements were performed in white light and fluorescent light. The rank of coal has been determined on the basis of vitrinite reflectance measurement and physico-chemical properties.

The reflectance (R0) in the range of 0.36% to 0.44% and the results of the physico-chemical analysis (moisture ranging from 5.26% to 17.56% with the average content of 8.37%, and the Gross Calorific Value within the range of 23MJ/kg to 26MJ/kg and the mean value of 25MJ/kg allowed to classify the tested coal (according to the Polish classification) as węgiel brunatny twardy błyszczący (subbituminous coal). According to the UNECE International Classification of In-Seam Coals (ECE-UN, 1998), these are Low-Rank A (subbituminous) coals.

Petrographic analysis of coal in the No. 207 seam supplemented with palynological studies allowed the reconstruction of paleo-environmental conditions accompanying the formation of the No. 207 seam. From the floor of the seam to the first clay slate, three types of interlayered facies were identified. These include: high peat bog facies, forest facies, and reed facies. Besides clay slates, the area is dominated by open water facies and - to a lesser extent - reed and ombrogenic facies. Starting from the second (higher) layer of clay slates to tonstein layer, the area is dominated by high peat bog and reed facies, and the third - locally occurring - forest facies. From tonstein layer, towards the roof of the seam, the area is dominated by two interlayered facies: high peat bog and forest facies, with locally occurring reed facies. The roof of the seam is dominated by forest facies.

Two layers of clay slates suggest periodic, intense subsidence of the sedimentary basin.

Petrographic analysis of the sapropelic layer has shown the occurrence of lamalginite, which allowed to classify it as boghead.

The palynological analysis has shown that the Densosporites variabilis has a dominant share among other species in the majority of layers determined in the seam No. 207. A characteristic feature of micro flora assemblages is the presence of layers of large Megaspores, clearly visible with the naked eye in a macroscopic profile of the seam

To sum up **[I-6]**: The petrographic analysis has shown that the coal from the No. 207 seam corresponds to the second coalification jump. On the basis of microlithotypes and palynological analysis, eleven episodes facies sections have been determined. The high vitrinite and liptinite content in clarite and duroclarite, along with the share of vitrinertoliptite and a low share of mineral matter, qualifies tested coal from the No. 207 seam as a high quality energy resource.

The next paper **[I-12]** confirms the usefulness of microscopic examination under fluorescent light, as it provides precise data for determining macerals from the liptinite

group.

A set of parallel analyses performed in white light and fluorescent light by one analyst has demonstrated a significant difference between the content of macerals from the liptinite group and mineral matter, which is often identified as liptinite when measurements are performed in white light. The differences were especially large for liptodetrinite. On the basis of the measurement performed in white and fluorescent light in the No. 325 seam, the liptodetrinite content is 1.2% and 9%, respectively.

On the basis of the measurement performed in white and fluorescent light in the No. 325/1 seam, the liptodetrinite content amounts to 3% and 8.6%, respectively. When it comes to the mineral matter content, it amounts to 6.4% and 2.4% for the No. 325 and 325/1 seam, respectively.

To sum up **[I-12]**: Based on the vitrinite reflectance, coals from the No. 325 and 325/1 seams from the Mudstone Series of the KWK "Bolesław Śmiały" coal mine correspond to Medium-Rank C, ortho-bituminous according to the UNECE International Classification of In-Seam Coals (ECE-UN, 1998). Macerals from the inertinite group are present in small amounts. This suggests that these are reactive coals, suitable for coking and energy industries. The higher content of macerals from liptinite group and lower content of mineral matter identified in fluorescent light confirms that the analysis in white light is insufficient. This also applies to lignite (in the case of the identification of coal type).

The next papers **[I-13**, **I-14]** focused on the analysis of petrographic properties: the rank of coal, maceral and microlithotype content, and physico-chemical properties have been studied in order to reproduce the trend of facies development of the No. 507 and 509 seams from the Upper Silesian Sandstone Series occurring in the ZG "Siltech" mining area.

Coals from the No. 507 and 509 seams are characterized by the variability of petrographic composition. The No. 507 seam is macroscopically dominated by banded bright coal and dull coal, while bright coal occurs in smaller quantities in the bottom part of the seam.

The No. 509 seam is macroscopically dominated by banded bright coal, while dull coal occurs in smaller quantities in the middle part of the seam. Small amounts of bright coal occur in the form of lenses in the second layer (going from top to bottom of the seam) of dull coal.

Based on the vitrinite reflectance, with average value in the seam of R0 = 0.68%, the average moisture content of 3.8% and the average heat of the combustion (31873 kJ / kg) according to the UNECE International Classification of In-Seam Coals (1998), the coal from the No. 507 seam can be classified as medium-rank A bituminous coal However, according to the Polish classification, it is classified as ortho bituminous coal (type 32.2).

According to the UNECE International Classification of In-Seam Coals (1998), the coal from the No. 509 seam is also classified as medium-rank A bituminous coal, while according to the Polish classification, it is classified as ortho bituminous coal (type 32.2). The average reflectance of coal from the No. 509 seam is R0 = 0.75%, the average calorific value is 32280 kJ/kg, and the analytical moisture amounts to 2.5%.

To sum up **[I-13, I-14]**: Based on petrographic analysis, an attempt to interpret the trend of facies development and the depositional environment of coal from the floor to the roof of the No. 509 and 507 seams has been done. The test results were interpreted on the basis of quantitative variability of individual macerals in the seam. Based on the gelification index (GI) and the tissue preservation index (TPI) by C.F.K. Diessel (1992) [17] four zones in the No. 509 seam, going from the floor of the seam, have been determined. The first zone is characteristic for the high peat bog facies and is interlayered with the second zone dominated by reed and forest facies, while the entire third zone is associated with forest facies, and the fourth, the highest lying area, is dominated by forest and high peat bog facies.

In the case of the No. 507 seam, five zones have been determined. The first zone, going from the floor of the seam, is dominated by forest facies, while the second zone is composed of forest facies interlayered with high peat bog facies, the third zone is composed of reed facies, fourth is dominated by forest facies, while the last fifth zone is composed of high peat bog and forest facies.

The available data on the petrographic structure of the No. 507 and 509 seams is extremely valuable when developing the mine traffic plan due to the difficulties that may arise during the exploitation of seams. On the other hand, it has a "purely" cognitive level related to the possible restoration of the depositional environment of coal seams.

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**5.Presentation of other scientific and research achievements.**

***Before obtaining a doctoral degree:***

My scientific interests were formed and matured during the studies at the Faculty of Earth Sciences at the University of Silesia. The first interests were focused on sedimentology, which to this day accompanies me at almost every stage of my scientific and research activity. At the beginning of the third year of studies I focused on the organic petrology of fossil fuels under the watchful eye of a recognized authority in the field of organic petrology, Professor Krystyna Kruszewska, Ph.D. The first research work was related to the combustion of bituminous coal, which required the knowledge of the petrographic composition of fossil fuels and the ability to determine unburned organic matter in ashes and slags from power plants. I was able to study the issues related to the combustion process and the identification of forms of unburned organic matter in ash from power plants thanks to kind assistance of Magdalena Misz-Kennan, PhD who has spent countless hours teaching me and gave me all the knowledge on the behavior of fossil fuels during the combustion process in the power industry I could acquire. My commitment and work during the Master's studies have resulted in the publication of the paper „The coal matter in fly ash from Katowice steel work power station” in the Special Papers of the Mineralogical Society of Poland, Issue 22,

2003 (Appendix 3, point II, position B-1/[M-1]) and presented in the poster form at the conference organized by the Mineralogical Society of Poland and the University of Silesia in Cieszyn in 2003. I successively developed my interest in the field of research methods used in coal organic petrology, which has resulted in numerous publications on the use of fluorescence methods to identify macerals from the liptinite group in the No. 207 seam from the Cracow Sandstone Series (Appendix 3, point II, position B-2/[M-2]; B-3/[M-3]). In addition, I conducted petrographic studies on the assessment of the quality and use of coal from the No. 209 seam from the Łaziska Beds in the "Jaworzno" coal mine" (Appendix 3, point II, position B-4/[M-4]) and participated in studies related to the use of Oxyreactive Thermal Analysis (OTA) in order to identify the characteristics of spontaneous ignition of coal stockpiles (Appendix. 3, point II, position B-5/[M-5]). With the kind assistance of Professor Monika Fabiańska, Ph.D chromatographic analyses of bituminous coals from the KWK Jaworzno coal mine, which were presented by Mrs. Professor Monika Fabiańska at the conference organized by the Polish Academy of Sciences and the University of Silesia, 7 - 09.06.2005, were performed. The paper was published in electronic form (on CD) (Appendix 3, point II, position B-6/[M-6]). The activities associated with the GC-MS analysis were further developed in studies related to my doctoral dissertation and were used in the evaluation of the coal rank of coals occurring in the mining area of the "Jaworzno" coal mine.

***After obtaining a doctoral degree:***

Since 2008 – up to now I am employed as an academic in the Department of Geochemistry, Mineralogy and Petrography at the University of Silesia

Since 2009, I am a certified specialist in the field of petrographic analysis, accredited by the International Committee for Coal and Organic Petrology (ICCP). My research interests focus on the issues related to the petrology of coal and lignite, variability in the degree of thermal maturity of dispersed organic matter, the combustion process of coal and biomass, and coal carbonization process.

The studies on the structure of coals and restoration of the depositional environment were further developed but I focused on the need to deepen knowledge on research methods for the assessment of the quality of metallurgical coke and the identification of dispersed organic matter in sedimentary rocks.

In the years 2006-2010, within the framework of a partnership agreement between the University of Silesia and Southern Energy Concern, I have been the project manager during the research project focused on the evaluation of the quality of fuels and the efficiency of combustion of biomass and fossil fuels in eight industrial facilities (power plants).

In the years 2010-2015 I managed a total of 8 projects funded by the Ministry of Higher Education and the National Centre for Research and Development.

Two projects funded by the EUs Research Fund for Coal and Steel (RFCS) in the years 2010-2014 are among my significant scientific and research achievements. Coordinator and manager of the RATIO-COAL project (Appendix 3, point II, position B-1/[I-1]), http://ratio-coal.eu aimed at improving the quality of coal carbonization process by optimizing the

composition of the fuel used in coking blends. The innovative method for estimating the quality of metallurgical coke needed to produce high-quality steel and monitoring, control, and optimization system of the process of fuel preparation for coking, which was implemented - among others - in the Třinec Iron and Steel Works (The Czech Republic), have been developed. In addition, within the framework of a partnership agreement with the JSW, forecasting of the quality of coke using the coal samples collected from the currently exploited seams is being performed. The manager of the INNOCARB project; the University of Silesia as the partner of the project. The completed works have resulted in the production of new carbonaceous products replacing coke for blast furnaces, contributing to the reduced consumption of blast furnace coke. New products resulting from the project are already being implemented and practically used in the project partners. 3, point II, position B-7/[M-7]).

My next significant scientific achievement was the development of a statistical model, which was developed within the framework of cooperation between the University of Silesia in Katowice and Třinecké Železárny, a.s. (Czech Republic) in the years 2013-2015. On the basis of the research on an industrial scale, it has been found that there is a relationship between the reactive part of coal and the work needed to push the coke from the coke oven battery .A total of three series of tests were carried out on an industrial scale, including 14 tests of the coal blends of special composition (120 tonnes each). The basic rule when composing coal blends was to include the widest possible share of coal with the maximum variable degree of coalification , based on the capabilities of classical high-temperature carbonization process. The obtained results were subjected to comparative analysis and statistical analysis. A series of comparisons and charts, including summary charts of the main features, histograms of examined parameters, and correlation graphs of two and three variables (3D), were developed. .The variability indicators and the interrelationship between parameters were determined. On this basis, a model that will be used for predicting the work required to push coke from the coke oven battery, crucial for both the efficiency and safety of blast furnace coke production process, has been developed Further tests aimed at confirming and clarifying the effectiveness and repeatability of the proposed methods will be carried out on an industrial scale. To summarize: precise petrographic data serve not only to predict coke quality but also as a useful and safe tool used to optimally control the production of blast furnace coke. Statistics show that the varying degree of coalification of all macerals present in coal blends changes the composition of the important variables in the models used for predicting the work required for pushing coke. Given the particular conditions at Trinec coking plant, the work needed to push the coke can be predicted on the basis of the model presented below:

Pushing forces = 0.4884991688 (0.05345939443) - 0.001536236457(0.0006180480712) ∗ sum of reactive + 0.0008765810407 (0.0006180480712) ∗ b + 1.093212421E-005 (3.705181551E-006) ∗ Fall

The project results were presented in 2015 at the ICCS&T/ACSE International Congress (27 Sept – 01 Oct 2015), Melbourne, Australia (Appendix 3, point III, position B-1/[K-3]).

My next major scientific and research achievement is related to petro-physical studies carried out in a project managed by me in the years 2012-2014, financed by the National Fund for Environmental Protection, and led by the Polish Geological Institute - National Research Institute. The aim of the project was pre-mining underground methane drainage of coal seams accompanied with the development of a pilot plant (the first project of its kind in the world conducted in an active coal mine).The research report titled "The determination of petrophysical and petrographic parameters of coal from the seams No. 501-510 in the KWK Mysłowice-Wesoła coal mine for coal-bed methane analysis" was submitted to the project leader (Appendix 3, point II, position C-1/[R-1]).

Since 2015, I am the leader of the project funded by the National Centre for Research and Development under the TANGO funding opportunity and focusing on the implementation of the numerical and qualitative model of the deposit based on the Geolisp software by PhD Marian Poniewiera, which was supplemented with qualitative parameters of coal, into the structure of JSW SA coal mining company. It should be emphasized that this is a novelty on a global scale because innovative assumptions for numerical models of deposits, based on quality parameters of minerals, allowing to estimate - among others - the quality of coke or the suitability for coalbed methane drainage, gasification, and liquefaction, have not yet been developed.(Appendix 3, point II, position B-8/[M-8], B-10/[M-10], B-11/[M-11], B-12/[M-12]; Appendix 3, point III, position B-1/[K-2]).

In the period from 2005-2009, at the request of the Directorate of the Karkonosze National Park, I coordinated the observation of the effects of downhill skiing and associated infrastructure on the ecosystem of the Park (Appendix 3, point II, position B-13/[M-13], B-14/[M-14] and B-15/[M-15]). It should be emphasized that these studies go far beyond the strict scope of my professional interests (the genesis and industrial use of coal), and I consider them as mine personal contribution to the environmental protection.

Currently, as the only person in Poland, I have all three accreditations of the International Committee for Coal and Organic Petrology (ICCP) including: "Coal Blend Petrographic Analysis (CBAP Certificate No ICCP / CBAP / 13-111; "Measurement of Vitrinite Reflectance In Dispersed Organic Matter" Certificate No ICCP / DOMVR / 12- 111; "Vitrinite Random Reflectance Analysis and Maceral Analysis" Certificate No: ICCP / SCAP-111 / AB, http://www.iccop.org/person/iwonajelonek/

In 2016 I completed the "AutoCAD Certificate - basic course in the Authorised Training Center AUTODESK P.A. NOVA S.A.

In 2012 I was granted the Intellectual Property Management Certificate granted by the patent attorney at the University of Silesia, Office of Economic Cooperation.

In 2010 was granted the Management of International Projects within the 7th Framework Programme Certificate by the European Union Framework Programmes Regional Contact Point and the Poznań Science and Technology Park of the Adam Mickiewicz University in Poznań.

Since 2009 I have been participating in the ICCP working groups focusing on both scientific and practical use of fossil fuels. In 2009, I participated in the working group led by

Walter Pickel from the Coal & Organic Petrology Services Pty Ltd, Australia. In 2013, I took part in the 2012-2013 round robin of the ASTM D7708 working group organized by the International Committee for Coal and Organic Petrology (ICCP): "Standardization of reflectance measurements in dispersed organic matter: results from an effort to improve interlaboratory agreement" (Appendix 3, point II, position A-1/[A-1]).

In 2016 I took part in two working groups; the first was the continuation of the 2012-2013 working group ASTM D7708: ”Interlaboratory Study for ASTM D7708 Test Method for Dispersed Vitrinite Reflectance” led by Paul C. Hackley from the U.S. Geological Survey, USA http://www.iccop.org/workinggroup/identification-of-primary-vitrinite/. The second working group: „Identification of Dispersed Organic Matter WG (IDOM WG)” was led by Jolanta Kuś from the Federal Institute for Geosciences and Natural Resources (BGR) in GEOZENTRUM Hannover, Germany.

International contacts acquired during the implementation of the projects help in developing my professional skills and realizing new projects, which results are presented on international conferences

2014 – 2016. International MBA Program Master of Business Administration led by the Gdańsk Foundation for Management Development and the University of Silesia. The program is validated by the IAE Aix-en-Provence Graduate School of Management. The Diploma thesis was performed on July 1, 2016. The expected date of issuing the diploma: September 2016

In the years 2008 - 2014 I received scholarships at numerous prestigious foreign scientific centers and institutions from the private sector.

2014 - Scholarship under the framework of the "Cooperation through innovation" project, project no.: WNDPOKL. 08.02.01-24-007 / 12-00, under the European Social Fund co-financed by the European Union, implemented by the Combidata Poland Sp. zoo. in Sopot in partnership with the Centre for Innovation, Technology Transfer and Development Foundation of the University of Silesia (CITTRFUŚ) and the TUV NORD Poland Sp. zoo implemented under the Human Capital Operational Programme, Priority VIII, Regional Human Resources; Measure 8.2 Transfer of Knowledge; Sub-measure 8.2.1. Support for cooperation between science and business. The company: GGS-project, Laboratory of Geology and Environmental Protection, Chorzów (Poland).

2014 - Internship under the „Scholarship and Internship Fund for the development of knowledge transfer in the region" project, project No. POKL.08.02.01-28-020 / 12, co-financed by the European Union under the European Social Fund, carried out by the Techno-Park under the Human Capital Operational Programme, Priority VIII, Regional Human Resources, Measure 8.2 Transfer of knowledge, Sub-measure 8.2.1 Support for cooperation between science and business. The company: sm32 STUDIO Marek Mucharski, Żywiec (Poland).

In the year 2013: Eco-Internship within the European Social Fund co-financed by the European Union, implemented by the Regional Chamber of Commerce in Katowice and the

partners of the project, within the framework of the Operational Programme Human Capital Priority VIII - Regional Human Resources Management, Measure 8.2 Transfer of knowledge, Sub-measure 8.2.1 Support for cooperation between science and business. The company: Ecoliber Spółka Jawna from Żywiec (Poland).

I was granted the following LLP/Erasmus scholarships:

2012 – the LLP/Erasmus scholarship in the Instituto Nacional del Carbón, CSIC, Francisco Pintado Fe 26, ES-33011 Oviedo (Spain)

2010 – the LLP/Erasmus scholarship in the Trinecke Zelezarny, Třinec (Czech Republic)

2009 – the LLP/Erasmus scholarship in the Institute of Rock Structure and Mechanics ASCR, Academy of Sciences of the Czech Republic, Praha (Czech Republic)

2009 – the LLP/Erasmus scholarship in the Institute of Geonics Academy of Sciences of the Czech Republic, Ostrava-Poruba (Czech Republic)

2008 – the LLP/Erasmus scholarship in the Instituto Nacional del Carbón, (INCAR-CSIC), Oviedo (Spain).

In 2008 I was a finalist of the. I was a finalist of the competition for the Arthur Rojszczak Prize organized by the Club of Foreign Fellows of the Foundation for Polish Science in recognition of humanistic attitude, breadth of vision and the ability of going beyond the narrow confines scientific specializations. In the years 2013, 2014, and 2016 I received The Award of the Rector of the University of Silesia of the first (one time) and second degree (two times) for research and science activities.

Educational activities at the Faculty of Earth Sciences at the University of Silesia include the following lectures and tutorials: Coal Petrology – Field workshops for the students studying at the University of Silesia under the Erasmus programme, Special lecture for the students of Geology (1st and 2nd year students, Regional Geology of the world for the third year students of Geology (tutorials, bachelor studies), Geology and geomorphology for the first year students of Environmental Protection (tutorials, bachelor studies), Geology for the first year students of Environmental Protection (tutorials, bachelor studies), Field and laboratory workshops for the first year students of Geology (Master's studies), Laboratory for the first year students of Environmental Protection students (bachelor studies), and the Laboratory for the first year students of Environmental Protection students (Master's studies). In the years 2010-2015: BA thesis advisor for students of the Inter-Faculty Studies in Environmental Protection: Magdalena Wiktor, Paulina Lis, Marta Gemza and Przemysław Bartos. In the years 2008-2015: Master's thesis advisor for 12 graduate students. (Fields: Geology and Inter-Faculty Studies in Environmental Protection).

Beyond my scientific activities, I am a member of the following associations:

Since 2015: The Polish Association of Mineral Asset Valuators

Since 2014: The Polish Society of Friends of the Earth Sciences

Since 2013: The Society for Organic Petrology (TSOP)

Since 2008: International Committee for Coal and Organic Petrology (ICCP)

Since 2004: Polish Geological Society

Ivona Jelonek