

History of mining in the Olkusz region

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The rich silver, lead and zinc deposits in the Silesia-Cracow region supported one of Europe's oldest mining areas. Archaeological data document the use of silver by the Celts in coinage and art in the La Tène phase (400 BC to early AD) (Liszka and Świć 2004). The favourable conditions of ore deposition and its easy availability suggest that primitive mining was done in the Olkusz area much earlier, already in the Hallstatt (700–400 BC). The increased lead content of peat layers dating back to the 9th century indicates that lead mining and metallurgy went on at least since that time (Rozmus 2010). An earthen vessel with more than a hundred silver coins and two pieces of silver, probably from the 11th–12th centuries, was found in a cave called Jaskinia Okopy Wielka Dolna (Ginter 1978). Chemical analyses of the cast silver used in jewelry during this period confirm that the raw material came from indigenous deposits (Koziorowska 2002).

The first written mention of deposits in the Silesia-Cracow region, a document relating to extraction of silver, dates from the second half of the 12th century (*Ex Commisso nobis a Deo*, Bull of the Archbishop of Gniezno, 1136) (Molenda

1963; Grzechnik 1978; Sass-Gustkiewicz *et al.* 2001; Cabała and Sutkowska 2006). The town of Bytom played the most important role in exploitation of silver and lead ores in Silesia, dating back to the 11th century. Further east in Lesser Poland, Olkusz and nearby Sławków played that role (Molenda 1963). From the Middle Ages on, mining in Olkusz was widely renowned in Poland and elsewhere in Europe, as indicated by ore mining privileges granted by medieval rulers (Jaroś 1957) and also by preserved documents from distant parts of Poland written by Łukasz Opaliński and also by foreigners including Georgius Agricola (1556), Peter Albinus (1589–1590) and papal nuncios (Molenda 1972).

The heyday of opencast mining during the 12th and 13th centuries, associated with lead ore extraction and processing, brought many immigrants to the area. They were enticed by numerous privileges accorded to ore miners, specialists and settlers (Molenda 1963; Cabała and Sutkowska 2006). In 1374, Queen Elżbieta Łokietkówna granted mining privileges to Olkusz, guaranteeing settlers the right to prospect, mine and smelt ores for a period of

six years, while requiring the miners to donate part of the yield to the royal treasury. These privileges were extended by King Władysław Jagiełło in 1426, with regulations related to the management of open-pit mining (Molenda 1963; Liszka and Świć 2004). Successive rulers (Kazimierz Jagiellończyk, Zygmunt III Waza, Stefan Batory) also promoted the lead and silver industry, granting numerous privileges to miners (Roś 2009).

Several stages can be distinguished in the history of ore mining in the Olkusz region. The stages are related to the type of ore sourced, the different methods of extraction, and especially the development of new drainage techniques that allowed deeper deposits of metals to be exploited. The first period, from the 12th to the 16th centuries, is associated with exploitation of galena, from which lead (86.6% Pb) and silver were obtained. The oldest document about production of lead and extraction of silver from galena dates from the 13th century (1257) and mentions Olkusz (the original Stary (“old”) Olkusz mining settlement). Excavations carried out in Stary Olkusz indicate that a production settlement probably functioned in the early Middle Ages (11th and turn of 12th/13th centuries), later buried by the sands of the Pustynia Błędownska desert (Rozmus 2010). The second-largest mining centre, next to Olkusz, was the town of Sławków and its adjoining settlements including the then-village of Bolesław. Proof that Sławków initially was the largest town in the Silesia-Cracow region and was known for its lead extraction are the names of main streets (Sławkowska Street) in the largest cities in the south (Kraków and Wrocław), which ran in the direction of Sławków. Those street names had already been given when these cities were founded in 1257 and 1242 respectively (Wyrozumski 2011). In Sławków itself there were several mines still operating in the 15th century (Fig. 1). They were rather small, usually with

one pit-shaft, rarely two. In the 16th century, raw material was obtained from more than 70 active mines in an area of about 7 hectares bordering Olkusz; operations included digging through old dumps.

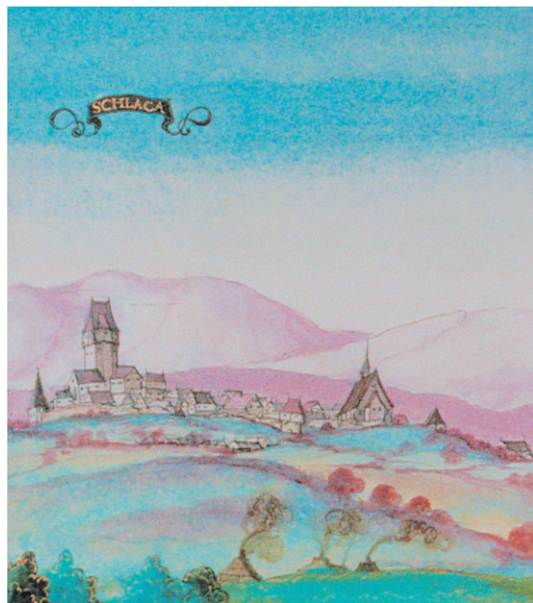


Fig. 1. Panorama of Sławków by Matthias Gerung, 16th century. In the foreground are smelters that operated during this time on the banks of the Przemsza river (source: Wikimedia Commons)

Ryc. 1. Panorama Sławkowa Matthisa Gerunga w XVI wieku. Na pierwszym planie widoczne czynniki w tym czasie huty zlokalizowane nad brzegiem Przemszy (źródło: Wikimedia Commons)

This area was of great importance as a mining centre, yielding 500–700 tons of lead annually. Fire-heated rocks were broken or crushed with pickaxes or hammers (Kamieński 1975). In the 14th century Olkusz was chartered as an autonomous mining town. During this period mining also went on in Bolesław, Tłukienka, Starczynów, Niesułowice and Gorenice, and in the 16th century also in Krzykawa, Koziół and around Sławków. The development of mining was significantly affected by complex ownership relations. The Olkusz iron-bearing area



Fig. 2. Medieval extraction of ores. Annaberger Bergaltar „Anagoria” (1521). Replica: Deutsches Bergbaumuseum Bochum (source: Wikimedia Commons)

Ryc. 2. Średniowieczne wydobywanie rud. Annaberger Bergaltar „Anagoria” (1521). Replik: Deutsches Bergbaumuseum Bochum (źródło: Wikimedia Commons)

was divided between the Bishopric of Cracow, the state treasury, Rabsztyń County, and royal holdings (Molenda 1963; Krygier *et al.* 1971).

Technological limitations initially restricted mining to the richest deposits located above the water table, buried at shallow depth or even lying on the surface; the main aim of mining was to obtain lead, and a little later also silver (Molenda 1963; Liszka and Świć 2004; Przeniosło *et al.* 2006; Roś 2009). The earliest mining was based on extraction of ore from small depressions (Fig. 2). Ore was processed and metals were smelted out close to the mines (Fig. 3). The oldest medieval mines usually had a central pit-shaft with two or three more around it within a distance of 24 metres (Fig. 4). The square or rectangular pit-shafts were small, 1–1.5 metres wide, and were often protected with a wooden cover.

Winding exploration galleries were dug from the pit-shaft at different levels; often they were only half a metre high. These pit-shafts and the 24-metre circle around them made up the basic mining unit (Molenda 1978). The galleries extending from the pit-shaft were maintained for a few years until the most profitable deposits were exhausted (Krygier *et al.* 1971; Grodzińska and Szarek-Łukaszewska 2002; Godzik *et al.* 2009; Blajda 2010). Later (19th–early 20th centuries), extensive horizontal pits were dug into hillsides, after which several diverging perpendicular galleries were gouged (Woch – Chapter 4, this volume).

At the end of the 15th century, Polish and European mining suffered a recession (Liszka and Świć 2004). The rich surface deposits were exhausted and the search for ore below the water table began (Molenda 1963; Krzyżanowski and Wójcik 2008). A major technical problem was to find a method for dewatering the deposits. Initially water was taken from pit-shafts with buckets or leather bags using hand hoists, and later with more efficient dippers and pumps driven by treadmills turned by horses (Molenda 1963; Kiryk and Kołodziejczyk 1978). Five adits (drained by gravity) were built near Olkusz and Bolesław during the second half of the 16th century. The adits discharged the water into rivers and streams (Krygier *et al.* 1971; Grzechnik 1978; Cabała and Sutkowska 2006). They permitted the operation of larger production units comparable to modern mines. During the adit period, mining in Olkusz experienced its greatest prosperity (Liszka and Świć 2004). Lead began to be extracted in Bukowno, Bydlin, Kuźnice, Okradzionów and Pomorzany. Many mines were built. Around one of the biggest adits there were 300 mines, and several hundred other mines working deposits drained by that adit (Nowak *et al.* 2011). Smelters were built, annually producing 1000–3000 tons of lead

from galena, which covered domestic needs (construction, printing, production of ammunition) and export to Bohemia, Moravia and Western Europe (Krygier *et al.* 1971). Silver was extracted from the richest deposits of lead; in the 16th century (1578–1601) the royal mint produced silver coins in Olkusz (Roś 2009). At the turn of the 16th/17th centuries, annual production reached 2000 tons of lead and 200 kilograms of silver. Due to the lack of adits in Sławków, Niesułowice and Gorenice, as well as depletion of deposits, exploitation in the Olkusz area gradually came to a standstill. From the second half of the 17th century, work focused mainly on areas east of Olkusz and on the southern edge of the ore-bearing area (Molenda 1978). At the end of the 17th century there were only two active adits (Molenda 1963; Krygier *et al.* 1971). Only small amounts of calamine were calcined (4–25% Zn); they were sent to plants producing brass in Gdańsk. In the 16th and 17th

centuries, old pits began to be mined for ore again. Old slag heaps were raked through on a large scale, and old pits were dug again. That probably is when the traces of earlier mining were obliterated (Molenda 1963; Krygier *et al.* 1971; Sass-Gustkiewicz *et al.* 2001). After underground mining declined, smelting of galena from the surface was started; this was connected with the construction of scrubbers, usually outside of the towns.

Mining and smelting in the Olkusz region briefly recovered in the late 18th century; this was connected with production of metallic zinc (Margraff 1743) and then with the development of methods for smelting zinc from calamine ore (1798, J.Ch. Ruberg) (Grzechnik 1978). Then the Olkusz Ore Company was founded and started construction of eight new pit-shafts, only two of which were completed. When the Duchy of Warsaw (1807) was created (Olkusz, Bolesław and Sławków were part of it), exploitation of



Fig. 3. Medieval ore processing. Artist unknown (source: Wikimedia Commons)

Ryc. 3. Średniowieczny proces przeróbki rud. Artysta nieznan (źródło: Wikimedia Commons)

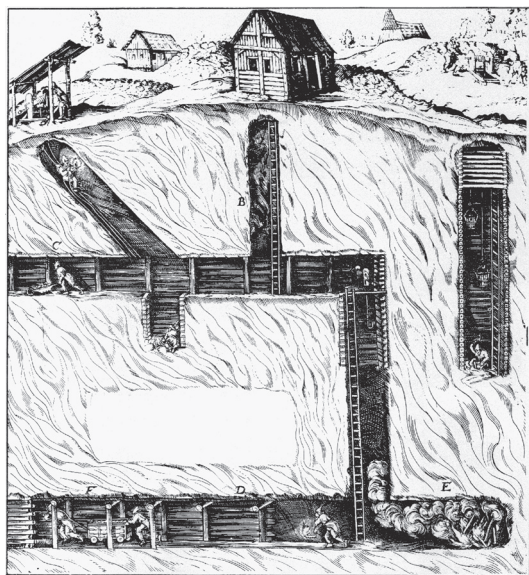


Fig. 4. The model of a 16th-century mine, after an illustration by G.E. von Löhneys' Bericht vom Bergwerck (1690) (source: Wikimedia Commons)

Ryc. 4. Model XVI-wiecznej kopalni wykonany na podstawie ilustracji G.E. von Löhneys' Bericht vom Bergwerck (1690) (źródło: Wikimedia Commons)

calamine began on a massive scale (Żabiński 1960; Molenda 1963). The mines were west of Sławków (called *Anna*, *Leonidas* and *Kozioł*) and in Tłukienka (*Bolesław* and *Jerzy*), Stary Olkusz (*Józef*), and in Krążek (*Ulisses*) (Kiryk 1978). Old documents suggest that exploitation or at least metal prospecting was also done at sites located near Sławków (mines called *Julia*, *Karol* and *Włodzimierz*), and around Olkusz (*Józef*, *Weronika* and *Zuzanna*) (Cabała 2009). In the Gorenice region further south, ore was extracted in the *Józef* and *Sylwester* mines in pit-shafts called *Sztolnia Pod Bukami* (Czerna area), *Róża* (to the north of Nowa Góra), *Henryk* and *Szczęście* (southwest of Nowa Góra), and the *Artur* mine (north of Miękinia) (Górecki and Szwed 2005).

In the mid-19th century, mining in Olkusz faced further difficulties. The richest calamine ore lying above the water table had already

been exploited and the deeper deposits were inaccessible. The mines required investment and modernisation. The state treasury stopped subsidising mining industry development. In 1865, Gustav von Kramst acquired a mine in Bolesław, for which he installed a calamine scrubber and expanded and modernised the mine drainage system, using steam engines, which improved dewatering but also raised production costs. In the 1870s the open part of an artificial underground river at a pit-shaft in Bolesław was rebuilt with government funding, giving access to deep-lying ores in Bolesław. The French-Russian Society for Mining, which owned several mines, installed a modern mechanical scrubber with flotation near Pomorzany. Exploitation of blende began but calamine mining was still more important.

In the early 20th century, companies with foreign capital (Saturn Company, French-Russian Society) explored and made production studies in different regions (e.g. near and to the west of Olkusz in the *Wiktór*, *Ulisses* and *Jerzy* pits). An important improvement was the construction of a rail line connecting Olkusz and Sławków with the Dąbrowa Basin (Molenda 1963; Krygier *et al.* 1971). Ore was enriched at a plant in Pomorzany, calcined in Bukowno, and melted in the *Ksawery* smelter near Dąbrowa Górnicza. During the Great Depression the *Ulisses* mine belonging to the Frankopol Company was flooded. The Sosnowiec Society, which owned the *Aleksander* mine in Bolesław, also exploited pits in Bolesław and Ujków. In 1928 the mine was leased to the Silesian Zinc Mines and Galvanising Plant. In 1929 the *Staszic* pit-shaft was deepened (it had flooded previously, after three years of operation).

When the mines flooded in 1931, mining activity in the Olkusz region halted (Krygier *et al.* 1971). During World War II the Nazi

occupiers reopened both mines and managed them under the common name *Bolesław*. The scrubber and the flotation facility in Bolesław were expanded. Extraction was intensive and wasteful, and hardly any preparatory work or prospecting were done.

World War II left the mines and processing plants devastated and in need of modernisation. After the war the communist authorities decided to expand the mine. The deciding factor was the discovery of large deposits of sulphides in the Bolesław region. The previously separate Bolesław Mines and Bolesław Metallurgical Factories were combined into the Bolesław Mining and Metallurgical Plant. At the same time the Mining and Metallurgical Plant in Bukowno was created. Geological research was done. From 1950 to 1970, approximately 3600 exploration shafts totalling 620,000 metres in length were drilled. This exploration led to the discovery of rich deposits of zinc ore untouched by previous mining activity (Grzechnik 1978; Paulo 2005). Calamine ore was mined at the *Bolesław* open pit in the 1950s, at *Michalska Halda* until 1962, at *Krążek* until 1985, and at Ujków Stary village until 1980. At the end of the 1960s the Olkusz Mines enterprise opened (*Bronisław*, *Chrobry* and *Stefan* pit shafts). It was closed down in 2003. The most recent mine, *Pomorzany*, was opened in 1974, with three pit-shafts (*Chrobry* – formerly belonging to the Olkusz Mines, *Dąbrówka* and *Mieszko*) and two ventilation shafts. Currently zinc-lead ores are mined there.

In addition to zinc-lead ores, iron deposits are also mined and processed in the Olkusz area and also near the towns of Jaroszewiec, Klucze and Rodaki (Feliksik 2011). In the 16th century there had been iron mines in the vicinity of Pilica. Iron mining was most developed in Pilica, Niegowonice, Pomorzany, Strzegowa, Wolbrom and Złożeniec (Kiryk 1978). An iron ore mine operated

in Jaroszewiec in the second half of the 19th century. Iron mining as an adjunct to zinc-lead exploitation in the Chechło area and between Olkusz and Bukowno is mentioned in documents from the early 20th century. At that time iron was exploited in Krzykawa (*Anna-Irena* mine), Cieśle (*Joanna* mine), and in the Sławków region. During the interwar period the *Trjumwirat* iron mine operated in Krzykawa (1925–1931). The *Lucyna* iron mine was established at the site of the zinc mines in Bolesław that had been flooded during the economic crisis in 1931 (Cabała and Sutkowska 2006; Feliksik 2011).

The rich resources of zinc and lead ore are gradually being depleted. In the near future it is planned to close the Bolesław Mining and Metallurgical Plant in Bukowno. Although the industrial plants are changing and the pit-shafts and mines are being closed, exploration work is still being done in the Olkusz area. This area probably will remain heavily industrialised, and that will continue to have a significant impact on the environment in the coming decades.

References

- AGRICOLA G. 1556. *De re metallica libri XII*. President Hoover, The Mining Magazine 1912. Wersja elektroniczna. http://www.farlang.com/gemstones/agricola-metallica/page_001.
- ALBINUS P. 1589–1590. *Meisznische Land und Berg-Chronica, in welcher ein vollnständige Description des Landes, so zwischen der Elbe, Sala und südöstlichen behmischen Gebirgen gelegen, so wol der dorinnen begriffenen auch anderer Bergwerken, sampt zugehörigen Metall und Metaller beschreibungen*. Gmel Bergen, Dresden.
- BLAJDA R. 2010. Ocena możliwości wykorzystania niezagospodarowanych złóż rud cynku i ołowiu regionu górnośląskiego. *Zeszyty Naukowe Instytutu Gospodarki Surowcami Mineralnymi i Energii PAN* 79: 111–120.

- CABAŁA J. 2009. *Metale ciężkie w środowisku geobuym olkuskiego rejonu eksploatacji rud Zn-Pb*. Wydawnictwo Uniwersytetu Śląskiego, Katowice.
- CABAŁA J., SUTKOWSKA K. 2006. Wpływ dawnej eksploatacji i przeróbki rud Zn-Pb na skład mineralny gleb industrialnych, region Olkusza i Jaworzna. *Prace Naukowe Instytutu Górnictwa Politechniki Wrocławskiej* **117**.
- FELIKSIK A. 2011. Przyroda Jury a eksploatacja kruszców na przykładzie Ziemi Olkuskiej. *Ilu-siana* **5**: 99–111.
- GINTER B. 1978. *Zarys pradziejów*, pp. 19–38. In: F. Kiryk, R. Kołodziejczyk (Eds.). *Dzieje Olkusza i regionu olkuskiego 1*. Wydawnictwo Naukowe PWN, Warszawa–Kraków.
- GODZIK B., KAPUSTA P., SZAREK-ŁUKASZEWSKA G. 2009. *Roślinność gleb galmanowych i jej znaczenie dla zachowania różnorodności biologicznej i krajobrazowej terenów pogórnich*, pp. 69–84. In: K. Sporek (Ed.) *Zagrożenia biotopów przekształconych przez człowieka*. Uniwersytet Opolski, Opole 2009.
- GRODZIŃSKA K., SZAREK-ŁUKASZEWSKA G. 2002. Hałdy cynkowo-ołowiane w okolicach Olkusza – przeszłość, teraźniejszość, przyszłość. *Kosmos* **51(2)**: 127–138.
- GÓRECKI J., SZWED E. 2005. Pozostałości dawnego górnictwa kruszcowego na Ziemi Krzeszowickiej. *Prace Naukowe Instytutu Górnictwa Politechniki Wrocławskiej. Konferencje* **111(43)**: 83–92.
- GRZECHNIK Z. 1978. *Historia dotychczasowych poszukiwań i eksploatacji*, pp. 23–39. In: *Poszukiwanie rud cynku i ołowiu na obszarze śląsko-krakowskim*. Prace Instytutu Geologicznego LXXXIII, Wydawnictwa Geologiczne, Warszawa.
- JAROŚ J. 1957. Przywilej górniczy z roku 1565 na wydobywanie kruszcu ołowianego i galmanu pod Długoszyńcem. *Kwartalnik Historii Kultury Materialnej* **2**: 315–318.
- KAMIEŃSKI M. 1975. *Surowce mineralne regionu krakowskiego*. Wydawnictwa Geologiczne, Warszawa.
- KIRYK F. 1978. *Zarys dziejów osadnictwa*, pp. 41–145. In: F. Kiryk, R. Kołodziejczyk (Eds.) *Dzieje Olkusza i regionu olkuskiego 1*. Wydawnictwo Naukowe PWN, Warszawa–Kraków.
- KIRYK F., KOŁODZIEJCZYK R. (Eds.). 1978. *Dzieje Olkusza i regionu olkuskiego 1*. Wydawnictwo Naukowe PWN, Warszawa–Kraków.
- KOZIOROWSKA L. 2002. Materiały złotnicze w świetle wyników analiz składu chemicznego srebrnych przedmiotów antycznych i wczesnośredniowiecznych. *Archeologia Polski* **47(1–2)**: 192–193.
- KRZYŻANOWSKI K., WÓJCIK D. 2008. IV Konferencja z cyklu „Dziedzictwo i historia górnictwa oraz wykorzystanie pozostałości dawnych robót górniczych”. Referat sesji III, Wrocław.
- KRYGIER E., MOLENDĄ D., SAŁADZIAK A. 1971. *Katalog zabytków budownictwa przemysłowego w Polsce, powiat Olkusz – województwo krakowskie*. Tom 3, Zeszyt 4, Część 1. Zabytki górnicze. Ossolineum, Wrocław–Warszawa–Kraków–Gdańsk.
- LISZKA J., ŚWIC E. 2004. *Zakłady Górniczo-Hutnicze „Bolesław”*. Dzieje-Wydarzenia-Ludzie. Zakłady Górniczo-Hutnicze „Bolesław” S.A., Bukowno.
- MARGRAFF A.S. 1743. “*Nonnullae novae methodi Phosphorum solidum tam ex urina facilius conficiendi, quam etiam eundem prontissime et purissime ex phlogisto et singolari quodam ex urina separato sale componendi*” [Some new methods of easily preparing solid phosphorus from urine, and making the same [i.e., phosphorus] as quickly and pure as possible from phlogiston and a particular salt extracted from urine] *Miscellanea Berolinensia ad incrementum scientiarum, ex scriptis Societati Regiae Scientiarum exhibitis* [Berlin miscellany for the increase of knowledge, from the published writings of the Royal Society of Science] **7**: 324–344.
- MOLENDĄ D. 1963. *Górnictwo kruszcowe na terenie złóż śląsko-krakowskich do połowy XVI wieku*. Studia i materiały z Historii Materialnej XV, Studia dziejów Górnictwa i Hutnictwa VIII, Ossolineum, Wrocław–Warszawa–Kraków.

- MOLENDĄ D. 1972. *Kopalnie rud ołowiu na terenie złóż śląsko-krakowskich w XVI–XVIII w.* Z dziejów postępu technicznego w eksploatacji kruszców. Ossolineum, Wrocław.
- MOLENDĄ D. 1978. *Dzieje Olkusza do 1795 roku*, pp. 147–340. In: F. Kiryk, R. Kołodziejczyk (Eds.) *Dzieje Olkusza i regionu olkuskiego 1*. Wydawnictwo Naukowe PWN, Warszawa–Kraków.
- NOWAK T., KAPUSTA P., JĘDRZEJCZYK-KORYCIŃSKA M., SZAREK-ŁUKASZEWSKA G., GODZIK B. 2011. *The vascular plants of the Ore-bearing Region* [Rośliny naczyniowe Olkuskiego Okręgu Rudnego]. W: Szafer Institute of Botany, Polish Academy of Sciences, Kraków.
- PAULO A. 2005. Zmiany bazy zasobowej metali nieżelaznych w Polsce w ostatnim 50-leciu. *Rudy i metale nieżelazne* **50**(9): 485–490.
- PRZENIOSŁO S., MALON A., TYMIŃSKI M. 2006. Analiza gospodarki wybranymi surowcami metalicznymi w Polsce z uwzględnieniem trendów na rynku światowym. *Przegląd Geologiczny* **54**(7): 579–583.
- ROŚ J. 2009. Olkusz – Srebrne Miasto: regionalny mit a rzeczywistość archeologiczna, historyczna i muzealna. *Ilcusiana* **1**: 23–30.
- ROZMUS D. 2010. Srebrne zamieszanie. *Ilcusiana* **3**: 7–16.
- SASS-GUSTKIEWICZ M., MAYER W., GÓRALSKI M., LEACH D.L. 2001. Zawartość metali ciężkich w glebach na obszarach eksploatacji rud Zn-Pb w rejonach olkuskim i chrzanowskim, pp. 189–208. Materiały Sympozjum Warsztaty 2001 nt. Przywracanie wartości użytkowych terenom górniczym. Wyższy Urząd Górniczy, Katowice.
- WYROZUMSKI J. 2011. Uwarunkowania historyczne rozwoju architektury średniowiecznego Krakowa. *Czasopismo Techniczne. Architektura* **108**(23): 1–12.
- ŻABIŃSKI W. 1960. *Charakterystyka mineralogiczna strefy utleniania śląsko-krakowskich złóż kruszców cynku i ołowiu*. Prace Geologiczne 1. Wydawnictwo Geologiczne, Warszawa.