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# CHEMICAL-MINERALOGICAL CHARACTERIZATION OF BAUXITES FROM DIFFERENT DEPOSITS

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**Abstract**: From the aspect of their chemical and mineralogical composition, bauxites are very complex multicomponent raw materials. The paper presents the characterization of bauxite from several different deposits: Brazil, Milići, Čitluk and Kosovo. Chemical characteristics were determined by a combination of different analytical methods: gravimetry, potentiometric titration, atomic absorption spectroscopy (AAS) and UV-VIS spectrophotometry. Mineralogical composition was determined using X-ray diffraction and thermal analysis methods. Chemical and structural characterization is complemented by the results of scanning electron microscopy with EDX analysis. The information obtained was used for the assessment of the quality of investigated bauxites from the aspect of their application in the production of alumina.

**Keywords**: bauxite, characterization of bauxite, X-ray diffraction, thermal analysis, AA spectrophotometry, UV-VIS spectrophotometry.

## 1. INTRODUCTION

### 1.1. Bauxites, basic characteristics of bauxites

Bauxite is the most important aluminium ore. It was first discovered in France (1821) in the vicinity of a place called Les Baux, after which it was named. Although it is often classified as a mineral, bauxite is a sedimentary rock, a polymineral aggregate composed of aluminium hydroxides known as mineral hydrargilite (gibbsite) $Al(OH)_3$, boehmite AlOOH and diaspore AlOOH. These three minerals are the main components of bauxite. The chemical and mineralogical composition varies within very wide limits. Depending on the mineralogical form of the aluminium present as the basic mineral, bauxites are divided into the following categories: hydrargilite(gibbsite), boehmite, diaspore and mixed (hydrargilite-boehmite and boehmite-diaspore). Apart from aluminium minerals, basic components of bauxite also include the minerals of iron, silicon, titanium, calcium and magnesium. A mixture may contain traces of minerals of a series of other elements: Na, K, P, Cr, V, Ga, Zn, Pb, Cu, Ni, Mn, Co etc [1].

The Bayer process for alumina production involves the alkaline treatment of bauxite at high temperatures whose aim is to obtain a solution of sodium aluminate and spontaneous decomposition of the obtained aluminate solution in suitable conditions of temperature, with the separation of aluminium hydroxide $Al(OH)_3$ and NaOH regeneration. Depending on the composition of bauxite, apart from aluminium minerals, other components also react, to a smaller or greater extent, with the caustic solution.

The quality of bauxite, when it comes to its application in production of alumina, is determined based on the silicon module, which represents a ratio between the concentrations of $Al_2O_3$ and $SiO_2$ in bauxite. The greater the value of silicon module, the higher the quality of bauxite, and vice versa. Bauxites with modules 10 are considered to be of high quality, those with modules between 8 and 10 can be

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processed, whereas those below 8 are such that their processing is not economically justifiable. The criterion mentioned is applied only to boehmite and diaspore bauxites. Due to lower temperature of leaching for hydrargilite bauxite, the harmful effect of silicon depends only on mineralogical forms which dissolve at these temperatures with NaOH since the temperature of leaching is lower than 150 °C [1].

High quality bauxites are becoming rarer and rarer, which is the reason for intensive investigations of mineralogical and chemical composition of bauxite, with a view to its greater and more profitable application in the production of alumina. Chemical-mineralogical characterization of bauxite prior to its application is particularly significant. This paper presents the results of the characterization of several different bauxite deposits.

### 1.2. Mineralogical modifications of aluminium and the accompanying elements in bauxites

Bauxite is a multi-component ore with over 100 different mineral forms identified. Aluminium is mainly present in bauxite in the form of hydrated oxides: hydragilite(gibbsite), boehmite and diaspore.

Hydrargilite (gibbsite) $Al_2O_3{\cdot}3H_2O$ is crystalized in a monoclinic system with a limited hexagonal dislocation of ions. The elementary cell consists of 8 aluminium (III) ions and 24 hydroxyl ions, which forms 8 molecules of $Al(OH)_3$. Gibbsite has a complex structure. It consists of alumohydroxyl layers which are built up of double layers of hydroxyl groups, among which aluminium (III) ions plane is distributed. Alumo hydroxyl layers are linked to each other by hydrogen bonds.

Boehmite ($Al_2O_3{\cdot}H_2O$) has a leaf-like structure. Each aluminium ion is surrounded by six oxygen anion, distributed on the corners of the octaedar. Double layers which are equally composed of hydroxyl ions and $O^{2-}$ ions are linked by hydroxyl bonds in boehmite. It differs from diaspore in its internal structure, and is softer than diaspore.

Diaspore ($Al_2O_3{\cdot}H_2O$) is another polymorphous modification of aluminium oxide hydrated with one molecule of water. It crystallizes in the same way as boehmite, in a rhombic system with a rhombic bipyramidal symmetry, but with different lattice parameters. Aluminium (III) ions are distributed in a dense arrangement of oxygen ions, so that each is linked to three oxygen ions.

Iron is found in bauxites in the form of different minerals, the commonest of them being water-free oxide hematite, $Fe_2O_3$ and hydrated oxide goethite, ($HFeO_2$), which differ considerably in colour, crystal structure and behaviour during processing. Magnetite and limonite are found in smaller quantities.

Silicon minerals are the most important and the most harmful impurities in bauxites. The most common ones are hydrated aluminosilicate kaolinite $Al_2Si_2O_5(OH)_4$ and quartz ($SiO_2$). Kaolinite reacts with the caustic solution at lower temperatures, and quartz remains stable up to higher temperatures.

Calcium and magnesium are mainly present in bauxites in the form of different carbonates. The most common of them are calcite ($CaCO_3$), magnesite ($MgCO_3$) and dolomite ($MgCO_3{\cdot}CaCO_3$). Bauxites also contain mineralogical modifications $TiO_2$ rutile and anatase, whose content varies between 2 and 3%. Other minerals that may occur are dolomite, muscovite, chabazite, crandallite, etc.

## 2. MATERIALS AND METHODOLOGY

### 2.1. Materials

For the experimental part of the research, whose results are presented in this paper, we chose the samples from the bauxite deposits Brazil, Milići, Čitluk and Kosovo. Bauxites were first crushed, dried at 105 °C and then ground to below 200 micron particle size.

### 2.2. Methodology

The experimental part of this paper was carried out in the laboratory of the alumina factory "Birač" in Zvornik and the University Centre for Electron Microscopy in Novi Sad. Characterization of the selected samples of bauxite was performed using the following methods:

– Preparation of samples for determining basic components**:** $Al_2O_3$, $SiO_2$, $Fe_2O_3$, $TiO_2$, was carried out according to standards JUS B.G8.520 and ISO 6994, by melting with a mixture of $Na_2CO_3$ + $Na_2B_4O_7$ and dissolving in an acid environment. The solution prepared in this way is used to determine $Al_2O_3$, $SiO_2$, $TiO_2$ and $Fe_2O_3$.

– Loss of ignition was determined using a gravimetric method according to JUS B.G8.510 (ISO 6606) standard.

– The content of $Al_2O_3$ was determined by the method of JUS.B.G8.512, potentiometric calculation on the automatic burette EBX TITRIPOL, titration of surplus complexion III with copper chloride.

– The contents of $SiO_2$, $Fe_2O_3$, $TiO_2$, $P_2O_5$ and $V_2O_5$ was determined based on the standard "VAMI" spectrophotometric methods, on the Lambda 25 spectrophotometer, supported by WinLab 32 software package.

– The contents of CaO, $Na_2O$, MnO and ZnO were determined by standard PERKIN ELMER AAS methods on PERKIN ELMER 4000 atomic absorption spectrophotometer.

– X-ray diffraction analysis was carried out on the PHILIPS PW 1710 diffractometer for powder, using Cu-anticathode ($K\alpha$=1.540526Å) under the following technical conditions: 40 kV voltage, 30 mA electric current, graphite monochromator, angled recording area $2\theta$ from 5 to 60°, step size of 0.02 s, time per step 1 s. The instrument and recording are operated by software package X'Pert Quantify, whereas X'Pert HighScore programme was used for the interpretation of the obtained diffractograms.

– Identification of the present mineral phases in the bauxites was performed by comparing experimental results with the characteristic values of interplanar distances selected in the database Powder Diffraction File. Characteristic d-values for the identification of minerals most commonly present in bauxites are shown in Table 1.

– Thermal analysis (DTA, TG, DTG) was carried out using a derivatograph "MOM" Budapest Q1510. The samples were investigated at the 20 °C − 1000 °C temperature range, with 10 °C/min heating rate in the atmosphere of air, with $Al_2O_3$ as a reference material. The analysis of the resulting thermograms was performed using Winder program.

– Morphological characteristics and the elementary composition of the particles of the samples selected were monitored by means of JOEL JSM 6460 LV EDX instruments, scanning microscope with the acceleration voltage of 20 kV, and the preparation of the samples was performed using BAL-TEC, SCD 005 SPUTTER COATER devices in the laboratory of the University Center for Electron Microscopy in Novi Sad.

*Table 1. Characteristic d-values of the minerals most commonly present in bauxites*

| Mineral | Characteristic d-values of the strongest currents/lines (Å) | Mineral | Characteristic d-values of the strongest currents/lines (Å) |
|---|---|---|---|
| Gibbsite-$Al(OH)_3$ | 4,85; 4.36; 4.32 | Anatase-$TiO_2$ | 3.52; 1.89; 2.38 |
| Nordstrandite -$Al(OH)_3$ | 4.79; 2.02; 2.26 | Rutile-$TiO_2$ | 3.25; 1.69; 2.49 |
| Boehmite -AlOOH | 6.11; 3.16; 2.35 | Quartz-$SiO_2$ | 3.34; 4.26; 1.82 |
| Diaspore -AlOOH | 3.99; 2.31; 2.13 | Calcite- $CaCO_3$ | 3.03;1.87; 3.85 |
| Goethite-FeOOH | 4.18; 2.45; 2.69 | Dolomite -$MgCaCO_3$ | 2.88; 2.18; 1.80 |
| Hematite-$Fe_2O_3$ | 2.69; 1.69; 3.68; 2.51 | Muscovite-$KAl_2(Si_3Al)O_{10}(OH)_2$ | 9.97;3.33; 4.98; 2.54 |
| Kaolinite-$Al_2Si_2O_5(OH)_4$ | 7.16; 3.56; 4.41 | Lithiophorite-$(Al,Li)MnO_2(OH)_2$ | 4.69; 9.38; 2.38 |

## 3. RESULTS AND DISCUSSION

This paper presents the results of the investigation of chemical and mineralogical characteristics of bauxite from four different deposits: Brazil, Milići, Čitluk and Kosovo (Table 2). The investigations were carried out from the aspect of determining the possibility of their application as a raw material in the production of alumina which later produces aluminium by the process of electrolysis. Among the investigated samples there are certain differences regarding chemical and mineralogical properties. The content of $Al_2O_3$ varies from 49.23 to 57.38 %, whereas that of $SiO_2$ is 1.47 to 5.69%. According to these values, the silicon module which serves to define the quality of bauxite ranges from 9.36 to 33.49. Based on the values of these three key parameters, these bauxites have good quality with high silicon module and high content of aluminium oxide.

The loss of ignition is known to depend on the mineralogical composition of bauxite. With the bauxites investigated this value ranges from 8.89 to 28.20% which indicates that they have different mineralogical compositions. Based on the high value of loss of ignition, it can be concluded that aluminium oxide is hydrated with three molecules of water in the Brazil bauxite, and one molecule of water in bauxites Milići and Kosovo, where it is necessary to take into consideration the results of x-ray and differential-thermal analysis in order to determine the type of monohydrate-boehmite or diaspore. The loss of ignition with the Čitluk bauxite is within these values, therefore it can be expected that both monohydrate and trihydrate are present in the bauxite. According to the results of the chemical analysis, the Čitluk bauxite is characterized by somewhat higher content of titanium dioxide. A higher content of ZnO is noted in the Čitluk bauxite, whereas the Brazil bauxite does not contain this component being a typical tropical bauxite. Iron is a very important component in bauxites and represents the basic component of the gangue. Depending on its mineralogical form, it acts differently and can limit the application of bauxite in the production of alumina reducing sedimentation properties of mud. The increased content of $Fe_2O_3$ was recorded in the bauxite Kosovo and Milići. Calcium oxide was not present in significant quantities in any of the samples. X-ray diffraction turned out to be the most reliable technique for phase analysis of bauxite. Phase identification is based on the fact that every crystalline substance gives its own characteristic diffraction image. The results of XRD analysis suggest that there are different mineralogical compositions, or different types of investigated bauxites (Figures 1, 2, 3, 4).

*Table 2. Chemical composition of the investigated bauxite samples*

| Components | Percentage , % m/m | | | |
|---|---|---|---|---|
| | Brazil | Čitluk | Milići | Kosovo |
| $Al_2O_3$ | 53.11 | 57.38 | 53.27 | 49.23 |
| $SiO_2$ | 5.22 | 3.99 | 5.69 | 1.47 |
| $\eta_{Si}$ | 10.17 | 14.38 | 9.36 | 33.49 |
| $Fe_2O_3$ | 11.60 | 17.57 | 26.07 | 37.25 |
| $TiO_2$ | 1.32 | 3.09 | 2.46 | 2.27 |
| CaO | 0.00 | 0.51 | 0.09 | 0.21 |
| g.ž. | 28.20 | 17.10 | 11.88 | 8.89 |
| ZnO | 0.000 | 0.030 | 0.020 | 0.008 |
| $P_2O_5$ | 0.039 | 0.129 | 0.047 | 0.093 |
| $V_2O_5$ | 0.026 | 0.080 | 0.045 | − |
| MnO | 0.003 | 0.130 | − | 0.053 |

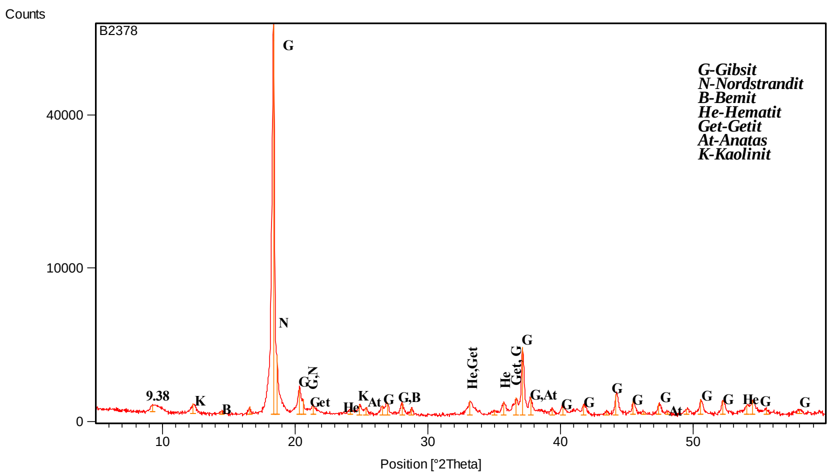



*Figure 1. Diffractogram of the Brazil bauxite sample*

According to the presented diffractogram, the dominant phase in the Brazil bauxite is gibbsite $Al(OH)_3$, which brings us to conclude that this is a gibbsite bauxite. Apart from gibbsite, a small quantity of $Al_2O_3$ is also a part of monohydrate boehmite. Among other minor minerals, the following phases are mainly present: kaolinite, hematite, goethite and anatase. Besides gibbsite, another polymorphous form is present- $Al(OH)_3$- nordstrandite, whose identification was performed based on the strongest peak *d-4.77 Å*. The peak with a very small intensity of *d–9.28 Å,* which is observed on the diffractogram of the Brazil bauxite, according to literature data [3] most likely belongs to lithiophorite (Al, Li)$MnO_2(OH)_2$, and has a very low share in the bauxite (Figure 1). The following mineralogical forms are recorded in the Čitluk bauxite: boehmite, gibbsite, hematite, goethite, kaolinite, anatase and rutile. According to the intensity of characteristic peaks, boehmite is present in larger quantities than gibbsite, hence the lower value of the loss of ignition. Moreover, $Fe_2O_3$ is in larger quantity in the form of goethite (Figure 2).The Milići bauxite sample is a typical bauxite in the location of Milići, belonging to boehmite type with satisfactory quality (silicon module 9.36). The following phases were recorded on the diffractogram of the Milići bauxite sample: boehmite, hematite, kaolinite, rutile, anatase and traces of calcite (Figure 3). Kosovo bauxites are known for their high silicon module (in the case of the investigated sample 33.49), the high content of iron oxide (37.25%) and a relatively low content of chemically bonded water (8.89%). According to the results of EDX analysis (Figure 12), bauxite also contains a small amount of Mn and Cr. Apart from the fact that the results of chemical analysis indicate that this is a high quality bauxite with a high silicon module, an x-ray diffractogram of the Kosovo bauxite shows that diaspore is the dominant phase, and the content of boehmite according to the intensity of peaks is around 5%. Diaspore is known to be the least reactive form of hydrated $Al_2O_3$ (Figure 4).

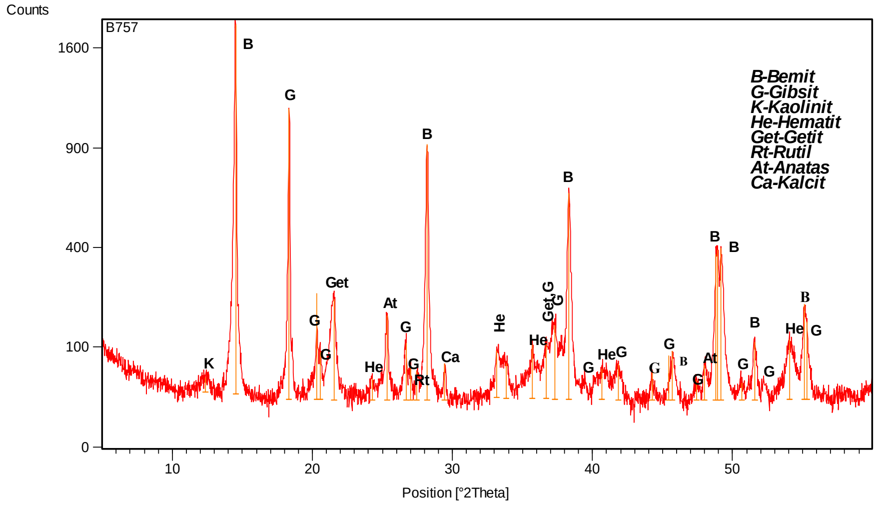



*Figure 2. Diffractogram of the Čitluk bauxite sample*

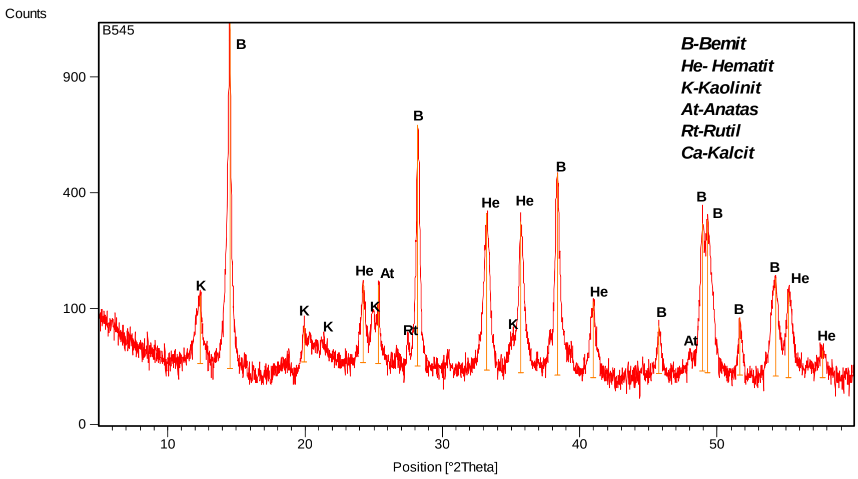



*Figure 3. Diffractogram of the Milići bauxite sample*

Thermal analysis of bauxite is complementary to x-ray diffraction analysis and varies depending on the deposit, impurities and crystallicity. By means of this group method (DTA, TG, DTG) certain mineralogical forms were recorded based on their characteristic behaviour when heating bauxite, which leads to the separation of moisture and crystal water built in the crystal lattice of gibbsite, boehmite, diaspore and kaolinite. Hematite, rutile and anatase do not undergo these changes. Qualitative characterization is reflected in determining the temperatures of phase transformations which occur in the course of thermal activation of samples, whereas quantitative characterization is reflected in determining the loss of mass in the sample in the course of its thermal activation and mineralogical composition [9]. Based on the results of thermal analysis (Figure 5), the Brazil bauxite is classified as gibbsite bauxite, which is shown in the reaction of dehydration at the temperature of 355 °C. This temperature range is characteristic of gibbsite and goethite. Dehydration effects of gibbsite and goethite are overlapping, which makes it difficult to identify and quantitatively determine the content of these phases in bauxite. The endothermal peak, i. e. characteristic temperature of endothermal changes caused by dehydration of boehmite and kaolinite, was recorded at the temperature of 564 °C. In this region, crystal water from boehmite present in the sample, the „deficient boehmite" which is formed by dehydratation of gibbsite and kaolinite, is separated. These effects are overlapped on the DTA curve into one extended and weak peak and are difficult to separate. Although this change is somewhat more easily discernible on the DTG curve, the loss of mass cannot be determined which belongs to individual reactions. However, the results shown are sufficient to be a complement to the XRD analysis results (Figure 5).

According to the surface of the characteristic endothermic peaks and based on the results of the XRD analysis, the Čitluk bauxite contains more boehmite than the gibbsite phase. Using the DTA curve it is difficult to establish the presence of goethite, though the change on the DTG curve at 387 °C and the loss of mass (TG) could correspond to goethite. Dehydration peak of gibbsite was observed at 322 °C, and endothermic peak at 541 °C is the result of dehydration of boehmite and kaolinite (Figure 6).

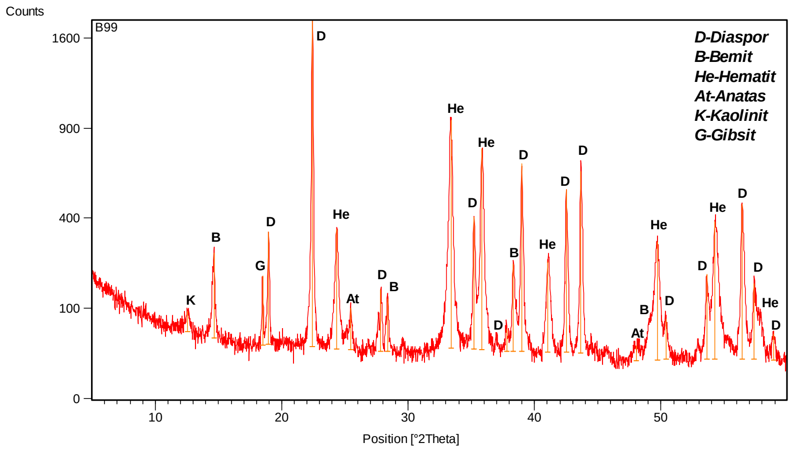



*Figure 4. Diffracotgram of the Kosovo bauxite sample*

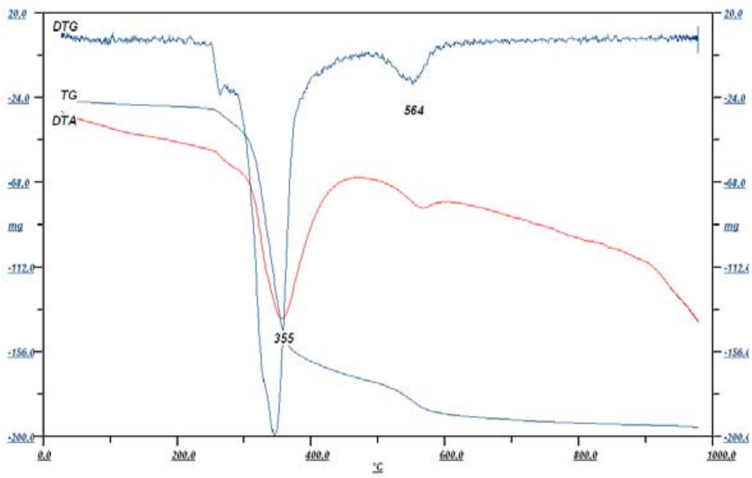



*Figure 5. Thermogram of the Brazil bauxite sample*

From the aspect of thermal analysis, the Milići bauxite is of boehmite type which is confirmed by the reaction of dehydration of boehmite in a characteristic temperature range at the temperature of 549 °C. According to the diffractogram of the investigated sample, all the $SiO_2$ is in the form of kaolinite, which is obvious based on the characteristic peak at the temperature of 586 °C. This peak is covered by dehydration of boehmite, so that it is much drawn out on the DTA curve; however, it can be more easily discerned if the DTG curve is taken into consideration. The DTA curve of the Kosovo bauxite shows only one endothermal peak at 538 °C, which corresponds to the reactions of dehydration and removal of the structural water of diaspore, boehmite and kaolinite. Due to a low content of boehmite and kaolinite compared to diaspore, these effects overlap with dehydration effect of diaspore

(Figure 8). Based on the results of electron microscopy with microprobe analysis it is obvious that aluminium minerals occur in bauxite with dispersed impurities of iron silicon and titanium minerals (Figure 9−12). The microprobe analysis shows that elementary composition of certain points is not homogeneous. When it comes to the Brazil bauxite, certain compact structure of hydrargilite particles is observed with impurities of iron, silicon and titanium minerals (Figure 9).

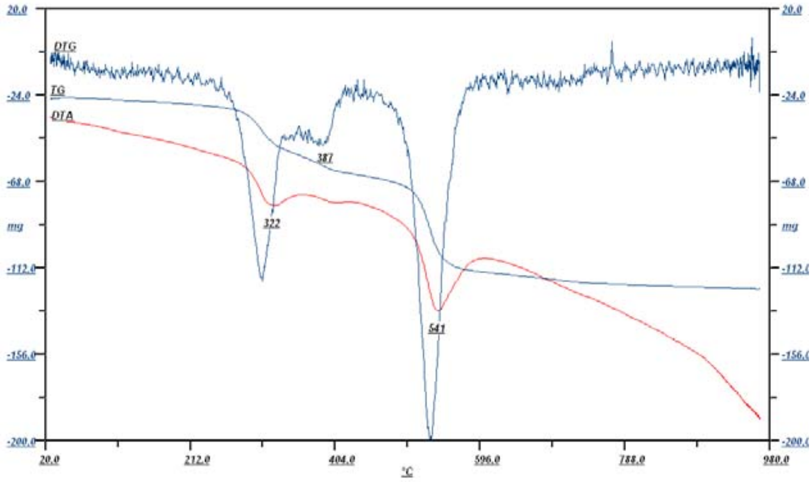



*Figure 6. Thermogram of the Čitluk bauxite sample*

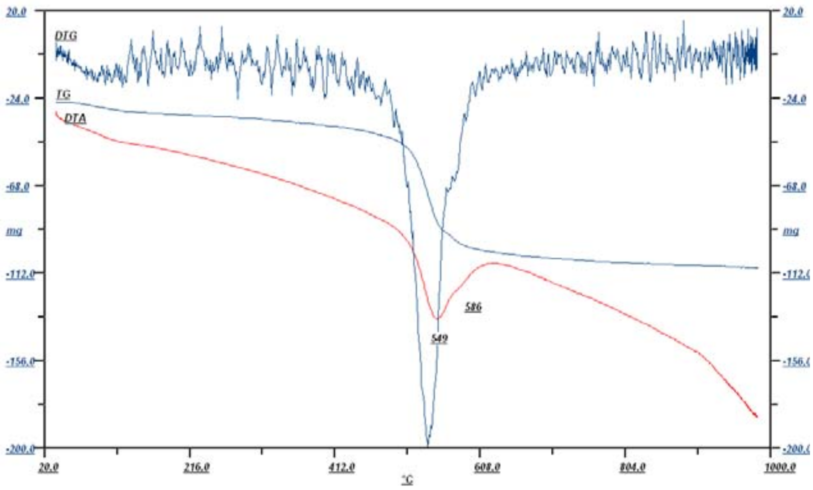



*Figure 7. Thermogram of the Milići bauxite sample*

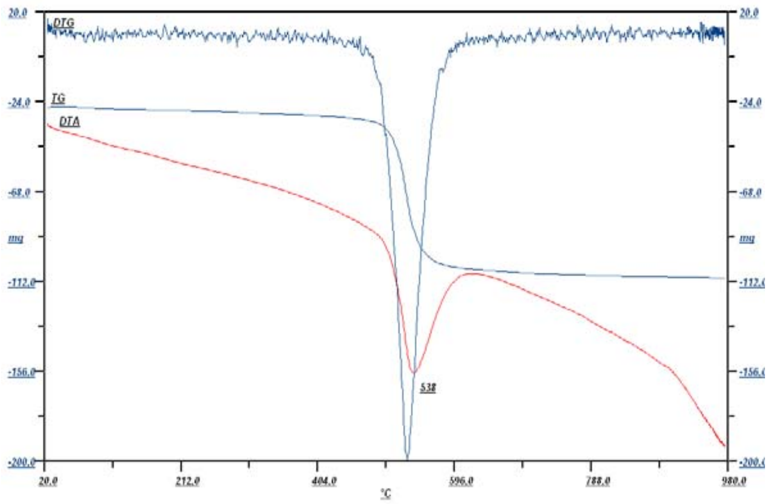
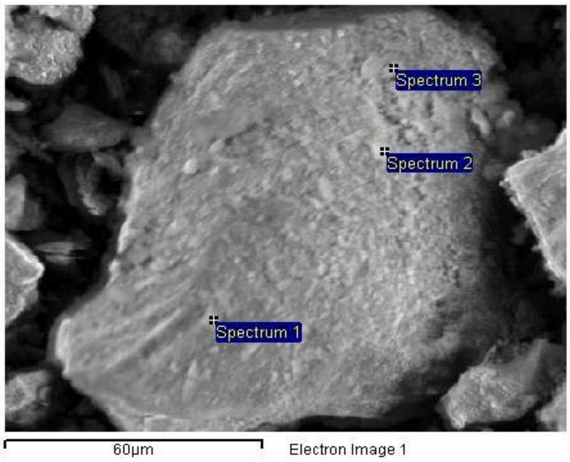



*Figure 8. Thermogram of the Kosovo bauxite sample*




| Spectrum | O | Al | Si | Ti | Fe | Total |
|---|---|---|---|---|---|---|
| Spectrum 1 | 59.67 | 31.79 | 3.25 | 1.02 | 4.26 | 100.00 |
| Spectrum 2 | 57.22 | 26.23 | 4.85 | 0.87 | 10.83 | 100.00 |
| Spectrum 3 | 44.95 | 17.43 | 5.94 | 1.76 | 29.92 | 100.00 |
| Mean | 53.95 | 25.15 | 4.68 | 1.22 | 15.00 | 100.00 |
| Std. dev. | 7.89 | 7.24 | 1.35 | 0.48 | 13.33 | |
| Max. | 59.67 | 31.79 | 5.94 | 1.76 | 29.92 | |
| Min. | 44.95 | 17.43 | 3.25 | 0.87 | 4.26 | |

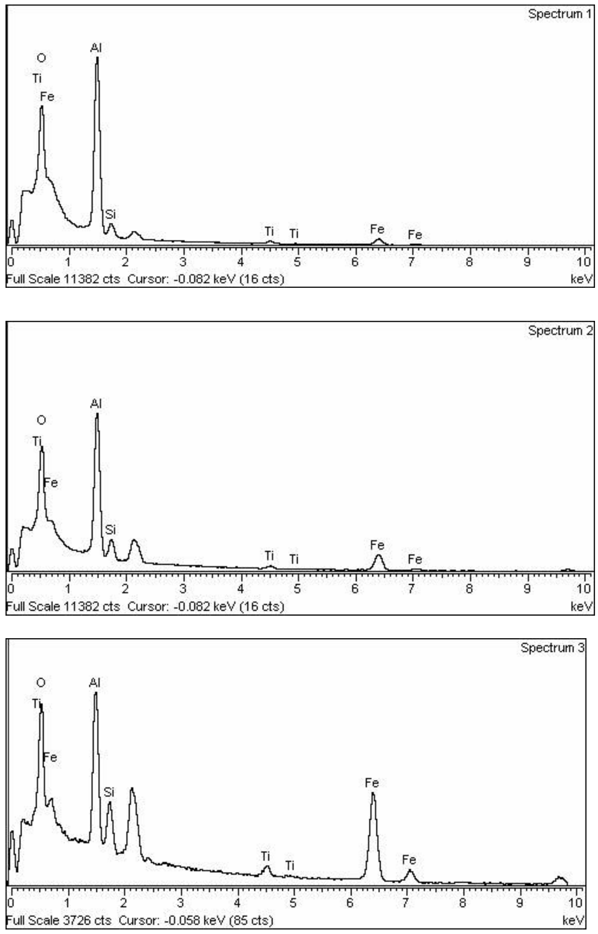
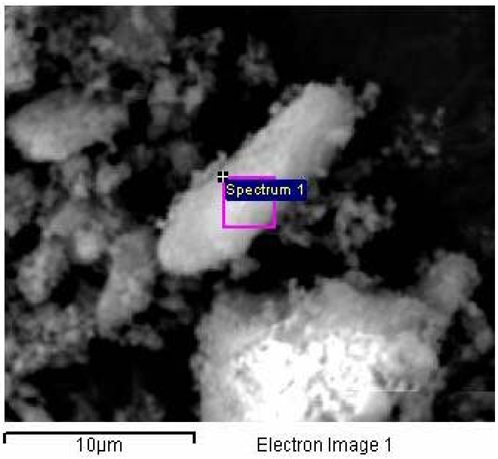
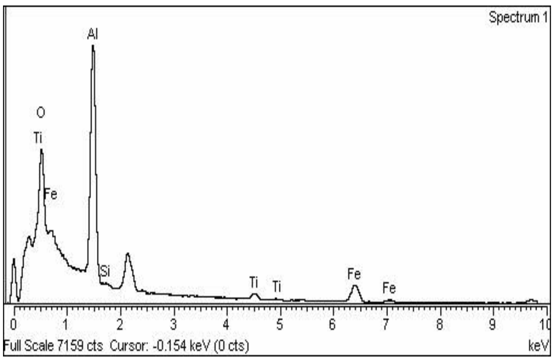



*Figure 9. EDX for the Brazil bauxite sample-three points of one particle*

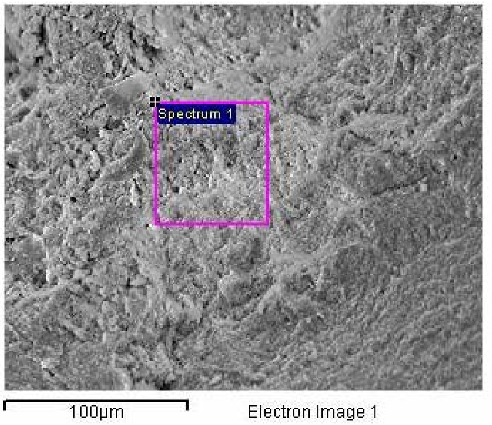


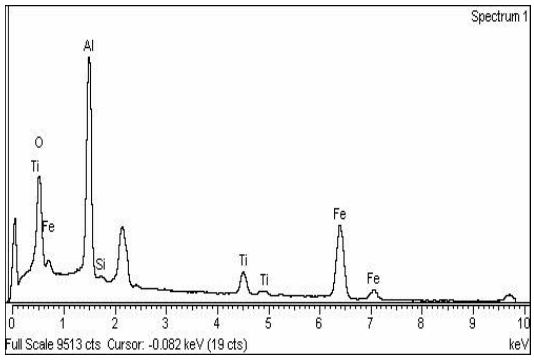




| Spectrum | O | Al | Si | Ti | Fe | Total |
|---|---|---|---|---|---|---|
| Spectrum 1 | 53.97 | 34.30 | 0.70 | 1.76 | 9.27 | 100.00 |

*Figure 10. Electron microscopy snapshot (SEM) with EDX for the Čitluk bauxite sample*

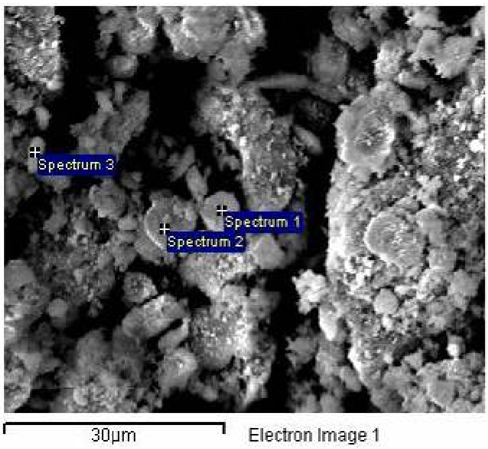
These impurities of other minerals are also present on polyhedron boehmite particles in the Milići bauxite, the most common one being hematite (Figure 11). Results of the electron microscopy of the Kosovo bauxite show diaspore particles of irregular shape, with inlays of minerals of other elements, especially those of hematite. However, based on EDX analysis of several points, in certain regions there are clearly discernible round hematite particles with impurities of other elements, which is expected considering a high content of $Fe_2O_3$ in bauxite. The results of these investigations that we presented are another proof of the complex composition of bauxite and they confirm the data found in literature stating that minerals in bauxite are intertwined rather than occurring separately (Figure 12).




| Spectrum | O | Al | Si | Ti | Fe | Total |
|---|---|---|---|---|---|---|
| Spectrum 1 | 43.98 | 24.73 | 0.72 | 4.32 | 26.26 | 100.00 |

*Figure 11. Electron microscopy snapshot (SEM) with EDX for the Milići bauxite sample - boehmite type*




| | Spectrum 1 | Spectrum 2 | Spectrum 3 |
|---|---|---|---|
| O | 24.47 | 42.04 | 47.48 |
| Al | 7.84 | 18.28 | 26.02 |
| Si | | 1.46 | 2.05 |
| Ti | 1.88 | 1.60 | 1.06 |
| Cr | 0.54 | 0.61 | |
| Mn | 0.68 | | |
| Fe | 64.58 | 36.00 | 23.38 |
| Total | 100.00 | 100.00 | 100.00 |

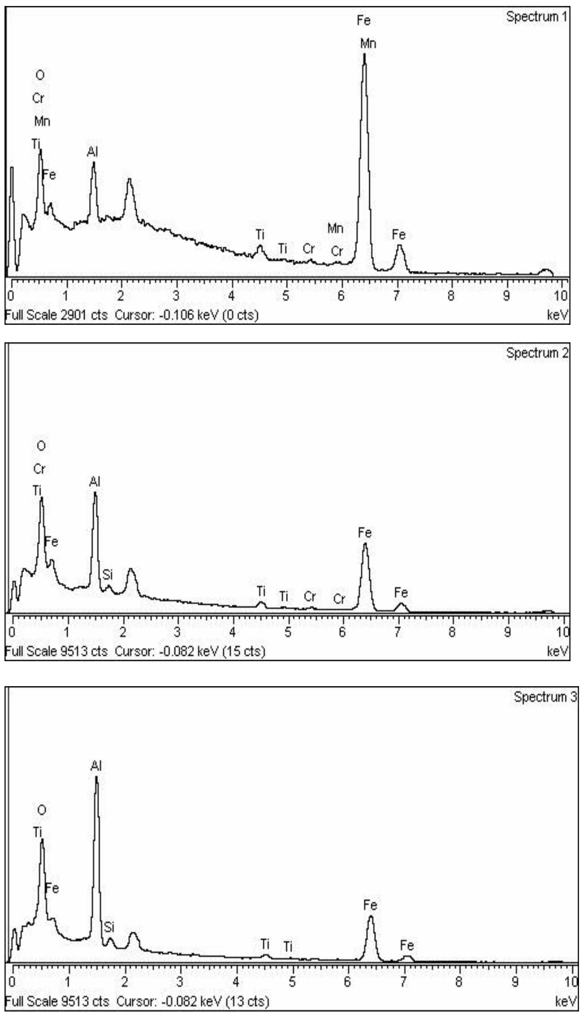



*Figure 12. Electron microscopy snapshot (SEM) with EDX for the Kosovo bauxite sample – diaspore type*

## 4. CONCLUSIONS

According to the results of all the investigations that were carried out (XRD, DTA, TG, DTG, AAS, UV-VIS, SEM with EDX analysis) it has been determined that the bauxites have the following characteristics:

− The main components in the investigated bauxites are the following: $Al_2O_3$, $Fe_2O_3$, $SiO_2$, $TiO_2$ and CaO, whereas the following occur as micro components: $P_2O_5$, $V_2O_5$, ZnO, MnO, $Cr_2O_3$, organic substances, etc.

− The Brazil bauxite is typical hydrargilite bauxite with $Al_2O_3$ mass fraction of 53.11% $\eta_{Si}$-10.17 silicon module. It is high quality bauxite, the mineralogical composition of which contains the following phases: hydrargilite, nordstrandite, boehmite, goethite, hematite, kaolinite and anatase.

− The Čitluk bauxite belongs to the mixed type with 57.38% $Al_2O_3$, 3.99% $SiO_2$ and $\eta_{Si}$-14.38 silicon module. It is high quality bauxite, but a considerable quantity of $Fe_2O_3$ is in the form of goethite which could have a negative effect on certain stages of processing. Qualitative mineralogical composition contains the following phases: boehmite, gibbsite, hematite, goethite, kaolinite, anatase, rutile, and calcite.

− The Milići bauxite is typical boehmite bauxite, with $Al_2O_3$ mass fraction of 53.27%, $SiO_2$ of 5.69% and silicon module of $\eta_{Si}$ −9.36, with the following mineral forms present: boehmite, hematite, kaolinite, rutile, anatasee and traces of calcite.

− The Kosovo bauxite is typical diaspore bauxite, with a very high silicon module (33.49), and a higher content of hematite (37.25%). The phase composition of the sample contains the following mineralogical forms: diaspore, boehmite, hematite, kaolinite, anatase, calcite, and possibly a small amount of gibbsite and rutile. Since diaspore has the most stable structure of all aluminium minerals, processing of this bauxite according to Bayer process requires a higher temperature and energy consumption, so the presence of other types of bauxite is not desirable.

− Based on the results of electron microscopy with EDX analysis it is obvious that aluminium minerals in bauxite occur with dispersed impurities of iron, silicon and titanium minerals. The microprobe analysis shows that elementary composition of certain points is not homogeneous.

− Chemical and mineralogical composition of the selected bauxites is complex and varies widely depending on geographical background and the manner of formation. From the aspect of their application in the production of alumina, the investigated bauxites are of high quality; however, the final decision requires a technological characterization in the form of the Bayer process simulation.

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ХЕМИЈСКО-МИНЕРАЛОШКА КАРАКТЕРИЗАЦИЈА
БОКСИТА РАЗЛИЧИТИХ ЛЕЖИШТА

**Сажетак**: Са становишта хемијског и минералошког састава боксити су комплексне вишекомпонентне сировине. У раду је извршена карактеризација боксита неколико различитих лежишта: Бразил, Милићи, Читлук и Косово. Хемијске карактеристике одређене су комбинацијом више аналитичких метода: гравиметрија, потенциометријска титрација, атомска апсорпциона спектроскопија (AAS) и UV-VIS спектрофотометрија. За утврђивање минералошког састава коришћене су рендгенска структурна анализа (XRD) и методе термичке анализе (DTA, TG, DTG). Допуну хемијској и структурној карактеризацији пружају резултати скенирајуће електронске микроскопије (SEM) са EDX анализом. Добијене информације искоришћене су за оцјену квалитета испитиваних боксита са аспекта њихове примјене у производњи глинице.

**Кључне ријечи**: боксит, карактеризација боксита, x-ray дифракција, термичка анализа, AA спектрофотометрија, UV-VIS спектрофотометрија.