Production of ceramic monoliths from diatomaceous earth

Arianit A. Reka[1,2]
Blagoj Pavlovski[3], Kiril Lisichkov[3], Belinda Amiti[1,3], Nora Limani Bektashi[4], Ahmed Jashari[1], Petre Markreski[5]

[1]*Faculty of Natural Sciences and Mathematic, University of Tetovo, Str. Ilinden, nn., Tetovo, Republic of North Macedonia*
[2]*NanoAlb, Albanian Unit of Nanoscience and Nanotechnology, Academy of Sciences of Albania, FanNoli square, 1000 Tirana, Albania*
[3]*Faculty of Technology and Metallurgy, Ss. Cyril and Methodius University, Ruger Boskovic 16 1000 Skopje, Republic of North Macedonia*
[4]*Department of Food Technology, Faculty of Technological Sciences , "Mother Teresa" University, Mirche Acev 4, 1000 Skopje, Republic of North Macedonia*
[5]*Institute of Chemistry, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University in Skopje, Arhimedova 5, 1000 Skopje, North Macedonia*

arianit.reka@fulbrightmail.com

Abstract

The natural diatomaceous earth (DE) from around city of Bitola (North Macedonia) expressed low bulk density (0.62–0.67 g/cm^3), high-water absorption (73–82%) and porosity (67–71%). For the determination of the chemical composition ICP-MS was employed, providing the following results for the DE: SiO_2 (63.59 wt%), Al2O3 (11.65 wt%), Fe2O3 (5.94 wt%), MnO (0.14 wt%), TiO2 (0.68 wt%), CaO (1.59 wt%), MgO (2.29 wt%), P2O5 (0.15 wt%), K2O (1.69 wt%), Na2O (0.95 wt%), LOI (11.29 wt%). XRPD results of the examined sample show prevalence of crystalline phase with small amount of amorphous behavior. The crystalline mineral phases present are the following: silica (quartz), feldspars (plagioclase), mica (muscovite), chlorites and dolomite. Microscopic analysis (SEM and TEM) results show presence of micro and nanostructures with pores ranging from 260 to 650 nm. The sintered diatomaceous earth (at three temperature intervals 900, 1000 and 1100°C, for a period of 1 h) showed alteration of the silica phase. Namely, sintered samples at 1100°C expressed thermal stability and formation of new phases (mullite and tridymite). Samples showed high compressive strength of 22 MPa and bulk density of 1.16 g/cm^3.

References

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