

Thermal behaviour of clay mixtures with bauxite residue for the production of heavy-clay ceramics

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Abstract

“Bauxite Residue”, BR, is the main by-product of the alumina-producing Bayer cycle. Aiming at its utilisation in the production of heavy-clay ceramics, the thermal behaviour of clay body mixtures with BR was investigated. The process parameters examined were the calcite content in the clay body mixture and the firing temperature, in relation to different BR additions in the clay body mixture. The firing process was studied by means of DTA–TG and dilatometry whereas the mineralogy was determined by XRD. The DTA–TG curves did not reveal cross-reactions between body mixture and BR. However, in the mixtures with BR, sintering initiated at a lower temperature and the firing shrinkage was increased. Moreover, a second shrinkage zone was observed for high BR content and firing temperature above 950 °C, suggesting the development of a low viscosity liquid phase. The main mineralogical phases present in the BR modified mixtures after firing were quartz, hematite, clinopyroxenes, gehlenite and plagioclase. The formation of clinopyroxenes and gehlenite seems to be dependant on all process parameters examined, i.e. calcite content in the clay body mixture, BR addition and firing temperature.

Keywords: Red mud; Traditional ceramics; Sintering; Bauxite Residue