

## **Novel iron-rich tiling ceramic from copper flotation waste**

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An innovative type of tiling ceramics is obtained using high amounts of copper flotation waste in the batch. The compositions are based on fayalite ( $2\text{FeO} \cdot \text{SiO}_2$ ), which is divided from the main waste of “Aurubis-Bulgaria” – Pirdop with magnetic separation. As plastic materials are used industrial clay or kaolin ( $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ ), while as inert additions - waste container glass or quartz sand.

The “green” specimens are obtained by dry milling of the raw materials below 75  $\mu\text{m}$ , humidification with 7 w t% distilled water and pressing with laboratory pneumatic press at 40 MPa. The densification and the phase formation processes are investigated by contactless optical dilatometry and simultaneous thermal analysis (DTA-TG), respectively. The phase composition, the structure and the morphology of synthesised samples are evaluated by XRD, SEM-EDS, optical microscopy and gas pycnometry.

Because of the specific chemical and mineralogical compositions the investigated iron-rich ceramics are characterised by an unusual sintering process, which carries out in the relatively low temperature interval between 1150 and 1200  $^{\circ}\text{C}$ . Due to intensive re-crystallisation processes, taking place during the heat-treatment, are formation new alumo-silicate and silicate phases having significantly lower densities than one of the parent fayalite. This curious phenomenon leads to a significant reduction of the firing shrinkage of new ceramics, which can be considered as a significant technological advantage. In addition, the final samples show low porosity and high crystallinity, which are the main preconditions for good mechanical characteristics of the final materials.

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