



PROJECT "THEORY AND APPLICATIONS OF SINTER-CRYSTALLIZATION" DN 19/7

## Structure and phase composition of ceramics based on huge amount of MSWA

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**Abstract:** The opportunity to obtain new low cost ceramics without traditional fluxes, which are based on 60 wt% bottom ashes from municipal solid waste incinerator (MSWA) and 40 wt% industrial clays, is discussed. Two fractions of pre-treated MSWA (above and under 2 mm), having different chemical compositions, were milled and mixed with three various industrial clays. Thus obtained six ceramics are characterized with almost constant quantity of 12-14 wt % CaO, while the SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> ratio decreases from 3.6 to 1.6. Practically all compositions are located in the crystallization field of anorthite; the ceramics with higher SiO<sub>2</sub> amount are near to the eutectic with silica, while these with the maximum alumina percentage are closer to CaO·Al<sub>2</sub>O<sub>3</sub>·2SiO<sub>2</sub> stoichiometry.

The optimal sintering temperatures were estimated by contactless optical dilatometry. Then the final phase compositions and the structures of obtained ceramics were elucidated by XRD, SEM-EDS and gas pycnometry.

The eutectic compositions are characterized by inferior crystallinity and some open porosity. Notwithstanding of the higher viscosity of formed liquid phase they sinter at lower temperatures and are have narrower un-technological firing interval.

Contrary, the ceramics richer of alumina form high amount of crystal phase and structures somewhat similar to ones of the traditional glass-ceramics. These compositions exhibit a near zero water absorption and high mechanical properties. It was also demonstrated that their elevated crystallinity is result of supplementary phase formation carrying out during the cooling. This untypical for the rational ceramics crystallization leads to creation of some additional closed crystallization induced porosity.