

Resumen 82

DEVELOPMENT OF OPAQUE FRITS IN SPINEL SYSTEM

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Glazes are fundamental materials that provide physical advantages and aesthetic appearance to ceramic bodies. Frit, which is prepared by melting raw materials and rapidly quenching in water, is one of the main components of the glaze recipes. It can be also varied according to the desired surface property (transparent, opaque, gloss, matt).

High opacity plays an important role for the decoration of ceramic tiles. Zircon is widely used raw materials in both glazes and frits compositions to achieved desired levels of opacity. Due to the recent surge in the price of zircon, many researches have been carried out for alternative materials or new frits that are crystallizing to a glass-ceramic system that yield higher opacity. Phases in spinel crystal structure ($n=1.76-1.86$) are the closest phases to the zircon ($n=1.95$) with their high refractive index. They can be also crystallized easily from a glass structure. If high spinel crystallization is obtained from a frit, the costs of opacifying the glazes can be reduced.

Another important property of the crystals in the spinel system are their high hardness (15-16 GPa). In addition, crystals in this system are formed in small crystal size. If high crystallization can be achieved in the glassy matrix, high abrasion resistant opaque glazes can be developed. Thus, tiles with high abrasion resistance can be used in heavy pedestrian traffic areas.

This study aims to obtain opaque frits without using zircon in the spinel system which crystalize to $Mg_{1-x}Zn_xAl_2O_4$. Applied frits were fired in porcelain firing schedule and characterized by XRD and SEM together with opacity, glossiness and hardness.

Keywords: Frit, crystallization, spinel, opacity

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