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Sintering behaviour of a ZnO waste powder obtained as by-product from brass smelting

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Abstract

The effect of two sintering methods (conventional sintering and two-step sintering) and of alumina addition on the sintering behaviour of a ZnO-rich waste powder ($\text{ZnO} > 95 \text{ wt\%}$), a by-product from brass smelting industry, was studied aiming to improve the sintered density and grain size. Both conventional sintering and two-step sintering methods did not lead to fully dense powder compacts, as densification was conditioned by abnormal grain growth and the particle size of the ZnO-rich residue. When two-step sintering was used the grain growth was reduced comparatively to conventional sintering method. The highest relative sintered density (about 90 %) was achieved when samples of ZnO waste and samples of ZnO waste with 2 wt % added Al_2O_3 were processed by two-step sintering and corresponded to a mean grain size of around 18 μm and 7 μm , respectively. XRD and SEM results indicated that alumina addition helped to inhibit grain growth due to the formation of gahnite spinel (ZnAl_2O_4) precipitates in the grain boundaries of zincite (ZnO) grains.

Keywords: D. ZnO waste powder; A. Sintering; B. Porosity; B. Grain size

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