

Designing a Sn-slag composite with possible non-toxic applications to provide a pure metal casting environment

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Abstract

Foundry slag formed during the production of medium carbon steel was milled into powder which was then compacted into blocks to form heat treatment furnace refractory materials. The foundry slag was ball-milled into powders which were further heat-treated at 300, 400, 500, 600 and 700 °C for 1 h. XRD pattern of ball-milled and heat-treated slag powder showed the rhombohedral and face-centred cubic (FCC) eta-phase. The dominating phase detected through the XRD is the α -Al₂O₃ with a rhombohedral crystal structure. The corresponding lattice parameters for the rhombohedral crystal structure are $a = 0.476$ nm; $c = 0.129$ nm with R-3c # 167 space group and number. The density of the milled slag was measured at 3.325 ± 0.085 g/cm³, which is lower than pure alumina (3.69 g/cm³). After mixing the slag powder with Sn, a good microstructural bonding yielding alumina and tin oxide phases formed after sintering. Recycling of the waste foundry slag into a usable product provides an opportunity not only for value addition but alleviates the burden of slag disposal to preserve the environment.