Self-propagating High-temperature Synthesis of Oxide Solid Solutions Al₂O₃/Cr₂O₃/Fe₂O₃

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ABSTRACT

Characteristics of pressurized self-propagating high-temperature synthesis during combustion of a thermite-type mixture (Fe₂O₃/Al) + γCr₂O₃ was studied. The limits of liquid-phase combustion and oxide and metallic phase separation in the final products were determined. The formation of the microstructure, chemical and phase compositions of cast corundum-based oxide materials was studied. It was found that chromium oxide is low-active in redox reactions with aluminum and mainly participates in the formation of an oxide consisting of two phases: (A) a solid solution of Cr₂O₃ in Al₂O₃ and (B) spinel FeO-Al₂O₃(Cr₂O₃). Depending on the Cr₂O₃ content in the green mixture the A/B ratio may change along with their chemical and phase compositions. However, the metallic ingot microstructure and composition remain practically unchanged.