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Study on the Synthesis and Structural Characterization of the Cermets TiC/Fe by Self-Propagating-High-Temperature and by Thermal Explosion

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ABSTRACT

A study of the TiC/Fe cermets produced by self-propagating high-temperature synthesis and by thermal explosion with various quantities of added iron was performed. It was established that both experimental and calculated adiabatic temperature of combustion and the propagation velocity of the reaction front decrease with the addition of iron in the reactants. The addition of iron was optimized at 30 wt % to ensure the stability of the propagation. The products were characterized by X-ray diffraction (XRD); the reaction seems to start at the surface of the solid titanium particle and to proceed by solid-state diffusion of iron and carbon to form TiFe and TiC/Fe cermets composite. The evolutions of the phases, size, and density of TiC grains during both kinetics reactions were highlighted by X-rays diffraction, optical and scanning electronic microscopy equipped with microindentation and energy-dispersive X-ray spectroscopy, respectively.