

Synthesis of Dense TiC-Based Cermets by Electro-Thermal Explosion under Pressure with Confinement

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ABSTRACT

The Electro-Thermal Explosion under Pressure with Confinement (ETEPC) mode of Self-propagating high-temperature synthesis (SHS) has been studied for TiC and TiC + 20 wt %Ni from the elemental powders. The entire ETEPC procedure was performed in open air. X-ray diffraction shows the formation of TiC in both cases without oxide traces. Scanning electron microscopy shows that the application of a moderate pressure of 19.5 MPa leads to considerable improvement of the product final density when compared to the combustion wave mode of SHS. The addition of 20 wt % Ni to the Ti-C system improves the densification of the samples and leads to the formation of the Ti₂Ni intermetallic compound. These reactions lead to the refinement of the grain size of TiC as compared to the precursors, < 20 μm without Ni, and around 120 nm with the addition of 20 wt % Ni.

Key words: SHS, Electro-Thermal Explosion, Reactive Forging, TiC-Ni, densification.