

Kinetics and Mechanisms of Titanium Carbide Formation by SHS Using Time-resolved X-Ray Diffraction and Infrared Thermography

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Using infrared thermography and time-resolved X-Ray diffraction analysis, kinetics and mechanisms of TiC combustion synthesis are studied for two different carbon granulometries. The reaction is demonstrated to be faster and the combustion temperature to be higher in the case of a green compact made with fine carbon particles. Based on infrared thermography and temperature profile analysis, a new method has been developed to calculate activation energy. In the case of fine carbon particles, such an analysis supports the conclusion that TiC formation results from a dissolution/precipitation mechanism. For coarse carbon particles, the same method cannot be used as a consequence of unsteady propagation of the reaction wave.