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Microstructural Study of TiC Formed during Initial Stages of Combustion Synthesis

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Self-propagating high temperature synthesis (SHS) of TiC stopped as a result of increasing heat losses during the propagation of the reaction wave. Scanning electron microscopy and transmission electron microscopy were used in order to obtain information on the microstructures of the TiC products. It was demonstrated that two different TiC microstructures were obtained: the first one consisted of large TiC grains which surround Ti, the second one consisted of TiC nanocrystallites. The results led to the definition of two types of TiC nucleation sites. Finally, time resolved infrared thermography coupled with SEM and TEM observations were used to obtain the relationships between temperatures and microstructures. It was demonstrated that cooling rate and combustion temperature mainly control grain growth.