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**Effects of Environmental Gas on Combustion Synthesis
and Microstructure of Ni₃Ti-TiC_x composites**

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ABSTRACT

The synthesis of Ni₃Ti-TiC_x composites in three environmental gases involving elemental nickel, titanium and carbon (graphite) reactants is examined. Two chemistries, each with a varying amount of refractory phase, were studied in inert argon and reactive nitrogen and carbon dioxide environments. The environmental gas that the reactants are synthesized in shows effects on the combustion reaction kinetics, burning velocity and the product microstructure. The thermal properties of the environmental gases affect reaction exothermicity and can also act as “trigger” reactions. The formation of additional TiN and TiO/TiO₂ phases were observed for reactions carried out in the reactive environments. The microstructure of the product contains a substoichiometric TiC phase that correspondingly results in formation of Ni₃Ti intermetallic. TiC_x particle size and distribution are controlled mainly by reaction combustion temperature and burning velocity.

Keywords: *Combustion synthesis; porous material; metal matrix composites (MMC); ceramic matrix composites (CMC), environmental gas.*