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Core-rim structure formation in TiC-Ni based cermets fabricatedby a combined thermal explosion/hot-pressing process

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Abstract: TiC-Ni-based cermets were obtained by thermal explosion from different elemental mixtures(Ti, C, Ni and X, where X = Cr, Mo or W) and subsequently densified by hot-pressing under acyclic load. The whole process was performed in a single stage in the same experimentaldevice according to the following thermal and pressure procedure: a heating rate ramp up to1573 K without applying any load followed by an isothermal dwelling under a compressivecyclic load of 32 MPa. The thermal explosion synthesis occurred during the heating ramp at atemperature close to 1273 K that was practically independent of the starting nominalcomposition. The influence of different refractory elements on the chemical composition andmicrostructure of cermets was studied. SEM characterization showed that only with Mo andW, the cermets developed the characteristic core-rim structure. A high densification wasachieved, but decreased when the refractory elements were added. Nevertheless, in thesecases higher hardness values were obtained.

Keywords : Cermets, Thermal explosion, Core-rim microstructure, Solid-solution carbides