

Spark plasma sintering of (Ti,Cr)C nanopowders prepared by mechanical alloying

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Abstract

In this work, a novel nanostructured Ti_{0.8}Cr_{0.2}C powders were prepared by through mechanical alloying (MA) at room temperature and under argon atmosphere, from elemental Ti, Cr, and C powders without any additive. The MA process resulted in the formation of nanostructured (Ti,Cr)C powders with average grain size of 20 nm. The obtained nanopowders were then consolidated by spark plasma sintering (SPS) for 5 min at 1800 °C and under a pressure of 80 MPa. Microstructural changes and phase constituents of the powders before and after consolidation were mainly characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and energy dispersive X-ray (EDX). The results showed that the grain size is large, the relative density of the bulk samples can reach over 98 % and the Vickers hardness can reach 2345 HV. The sintered samples have superior mechanical properties achieved by increasing sintering temperature and pressure. Furthermore, XRD and TEM measurements proofed that SPS is a feasible technique to retain the original phase compositions and grain sizes.

Biography

Dr. Mohsen Mhadhbi obtained his Ph.D degree from the Faculty of Sciences of Sfax, Sfax University, Tunisia. He is currently Assistant Professor of Chemistry in National Institute of Research and Physical-chemical Analysis, Tunisia. His research interests include nanomaterials and nanotechnology, material engineering and powder technology. Mhadhbi is the author and co-author of several books and research papers. Mhadhbi has presented almost thirty communications in national and international conferences. He also has vast experience in teaching, conducting research and supervising candidates. Mhadhbi is Editor Board Member and Reviewers of a number of international journals.