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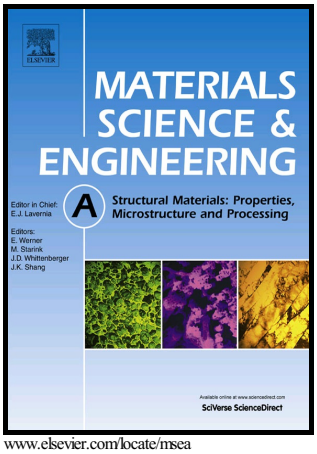

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Deformation Mechanism in Graphene Nanoplatelet Reinforced Tantalum Carbide using High Load *In situ* Indentation

Cheng Zhang[1], Benjamin Boesl[1], Laura Silvestroni[2], Diletta Sciti[2], and Arvind Agarwal[1*]

[1]Plasma Forming Laboratory, Department of Mechanical and Materials Engineering, Florida International University, Miami, FL, 33174, USA
[2]Institute of Science and Technology for Ceramics (ISTEC), CNR-ISTEC Faenza, Via Granarolo, 64 - 48018 Faenza (RA), Italy

Abstract

High load *in-situ* indentation testing with real time SEM imaging was carried out on spark plasma sintered graphene nanoplatelets (GNP) reinforced TaC composites. The prime goal of this study was to understand the deformation behavior and the reinforcing mechanisms of GNPs. The results suggest that addition of GNPs had significant effect on dissipating indentation energy and confining the overall damage area to a localized region of TaC. The average crack length reduced by 26% whereas total damage area shrunk by 85% in TaC-5 vol.% GNP sample as compared to pure TaC. TEM analysis concluded that well dispersed GNPs result in a strong and clean interface between TaC and GNP with trace amount of amorphous layer that leads to improved energy dissipation mechanism.

Keywords: High load in situ indentation; Tantalum Carbide; Graphene nanoplatelets; damaged area; interface

1. Introduction