Reviews on Advanced Materials and Technologies, (2019), vol. 1, no. 1, pp. 46-53

DOI: 10.17586/2687-0568-2019-1-1-46-53

Strengthening and Softening of Nanoceramics: A Brief Review

A.G. Sheinerman[1,2,3] and **M.Yu. Gutkin**[1,2,4,]

[1]Institute of Problems of Mechanical Engineering, Russian Academy of Sciences, St. Petersburg 199178, Russia
[2]Peter the Great St. Petersburg Polytechnic University, St. Petersburg 195251, Russia
[3]Saint Petersburg State University, 7/9 Universitetskaya nab., St. Petersburg 199034, Russia
[4]ITMO University, St. Petersburg 197101, Russia

Received: November 10, 2019 Corresponding author: A.G. Sheinerman

Abstract. We briefly review the experimental data, the results of computer simulations and analytical models that describe the mechanisms of room-temperature plastic deformation of nanocrystalline ceramics (NCCs) and the effects of these mechanisms on hardness of NCCs. We demonstrate the importance of grain boundary (GB) mediated processes, such as GB sliding, grain rotation and GB amorphization in NCCs. We show that these processes can be responsible for contradictive data on hardness of nanocrystalline $MgAl_2O_4$ spinel with small grain sizes, which demonstrate either direct or inverse Hall-Petch dependence for hardness.

ACKNOWLEDGEMENTS

This work is supported by the Russian Science Foundation (grant 18-19-00255).

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