



Microstructures generated in AISI 316L stainless steel by Vickers and Berkovich indentations

Daria Grabco, Olga Shikimaka, Constantin Pyrtsac, Andrian Prisacaru, Zinaida Barbos, Mihaela Bivol, Sergei Alexandrov, Dragisha Vilotic, Marko Vilotic

<https://doi.org/10.1016/j.msea.2020.140597>

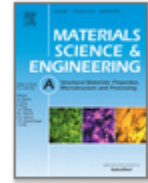
Abstract

The work aims for studying the specifics of deformation of AISI 316L stainless austenitic steel under the conditions of micro severe plastic deformation (mSPD) created locally at the submicro and micro levels using Berkovich and Vickers indenters. The deformation was carried out by instrumented (depth-sensing), quasi-static indentation and microscratching methods in the load interval $P = 10\text{--}2000$ mN. Studies have shown that various mSPD methods (submicro-, microindentation and microscratching) create similar patterns of plastic deformation in thin surface layers of the material. The stick-slip nature of the scratching process has been demonstrated. It has been established that in the region of loads below 50 mN, the intragranular deformation mechanism has the main contribution to the formation of indentations, while at loads above 50 mN, intragranular and intergranular mechanisms participate in the process, and the role of the latter becomes greater with P increase. Load growth leads to a decrease in hardness under submicro-, microindentation and microscratching for all applied mSPD methods. The type of mSPD method, as well as the type of indenter and the magnitude of the applied load are the factors affecting the mechanical



Materials Science and Engineering: A

Volume 805, 23 February 2021, 140597



characteristics that should be taken into account depending on the practical purpose of the AISI 316L austenitic steel products.