

EXPLORING NANO-WEAR MECHANISMS OF CU-BASED COMPOSITES WITH THE AFM CIRCULAR MODE

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Wear tests were performed using the AFM circular mode [1], in dry condition, on two Cu-based composites reinforced with added micro-sized (approx. 750 nm) and in-situ generated nano-sized (< 100 nm) Al₂O₃ particles. The nano-sized material shows a well lower wear rate (1/500) at the macroscale [2]. The circular mode allows measuring wear rate at the nano-scale (i.e. in the matrix) in stationary conditions with high sliding velocities (up to 1 mm/s) by obtaining well defined circular wear tracks. Topographic images of the various wear tracks have been measured to determine the wear rate for different parameters such as the sliding speed, the normal force and time. Results show that the nanosized composite has, also at the matrix level, a well lower wear rate suggesting that the decrease of the macroscopic wear rate is also due to a modification of the wear matrix behaviour (figure 1). The different behaviours of the wear rate with the different experimental parameters will be also shown and discussed in terms of wear mechanisms.

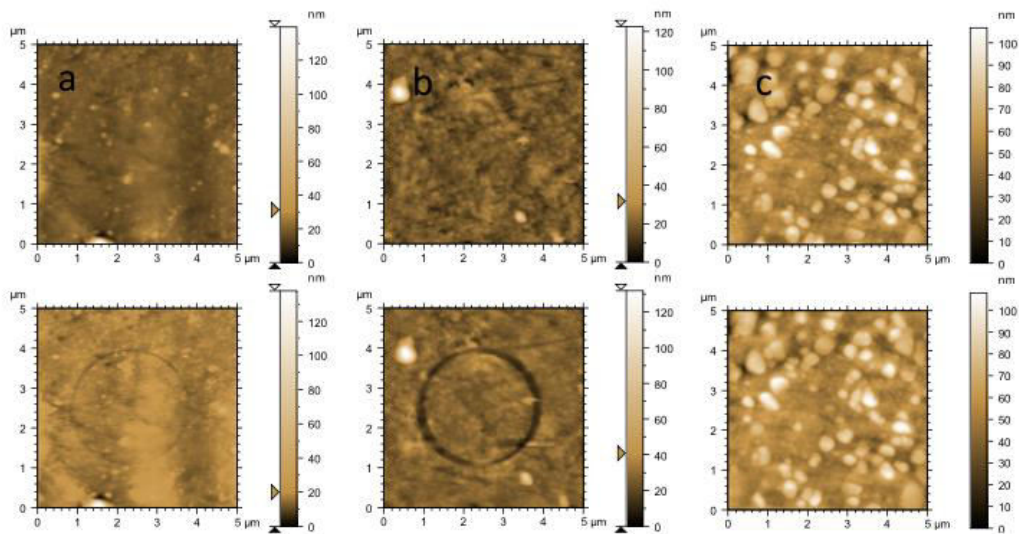


Figure 1: Topographic images of wear tracks on Cu-based composite charged with (a) and (b) micro-alumina Al₂O₃ and (c) nano-Al₂O₃-alumina particles using the AFM circular mode: Before (Top) and after (bottom) wear experiments.

[1] H. Nasrallah, P.-E. Mazeran, et O. Noel, Rev. of Sci. Instrum. 82, 113703 (2011).

[2] A. Venc, V. Rajkovic, F. Zivic, S. Mitrovic, I. Cvijovic-Alagic, M.T. Jovanovic, App. Surf. Sci. 280, 646 (2011).