Broadening of Topographical Protrusions in AFM Images upon Increasing Sampling Density

Milan Pavúk[1, a)], and Marcel Miglierini[1, 2, b)]

[1]*Institute of Nuclear and Physical Engineering, Slovak University of Technology in Bratislava, Ilkovičova 3, 841 04 Bratislava, Slovak Republic.*
[2]*Department of Nuclear Reactors, Czech Technical University in Prague, V Holešovičkách 2, 180 00 Prague, Czech Republic.*

[a)] *Corresponding author: milan.pavuk@stuba.sk*
[b)] *marcel.miglierini@stuba.sk*

Abstract. This study examines the influence of sampling density on topographical images obtained by Atomic Force Microscopy (AFM). Measurements were performed on an $Fe_{78}Sn_7B_{15}$ alloy prepared by rapid melt quenching. A denser raster of points where the microscope measured height led to an unexpected broadening of protrusions in the topographical image. In our opinion, this effect is caused by two factors that may act simultaneously: (1) a denser raster increases the probability that a measurement point will be located close to the edge of a topographic protrusion, where the convolution of the tip shape with the protrusion occurs, and (2) an increase in the effective radius of the probe tip (e.g., due to contamination or wear) altered the nature of the tip-surface convolution. This work shows that these effects can significantly influence the appearance of the topography image and should therefore be considered when analyzing samples with fine surface structures.