nanoSeminar Series 2022

Institute for Materials Science

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Controlled surface rippling on glass and polymer surfaces

Thursday, Feburary 3rd 2022
13:00 – 13:30

Normal: Seminar Room 115, Hallwachsstr. 3 (HAL)
Pandemic version: https://tinyurl.com/nanoSeminar-GA

In this talk controlled surface rippling on silica glass and polystyrene surfaces induced by scrapping with a sharp indenter is reported.

On silica glass single scratch tests with a nanoindenter tip were performed. The normal load was kept constant and scratch velocity was varied. AFM analysis reveal the occurrence of regular wavy surface patterns (ripples) in all scratch grooves. The periodicity of these ripples is in the range of sub-µm and increases linearly with scan velocity. The experimental results were interpreted assuming that the tip moves in a stick-slip motion.

On polystyrene surfaces areas in the range of a few μm^2 were structured by AFM scanning. By scrapping the surface in consecutive lines with a silicon tip within defined areas surface ripples were induced. The ripples tend to align a steady state angle defined by scan pattern. But the orientation can be modified significantly by geometric confinement. Squares, circles and stars were used to recognize the distinct influence of straight and curved edges.

Scratching the polystyrene surface repeatedly by AFM tip particles nucleated from the crests of the ripples were formed. The particles were detached smoothly and progressively displaced by the tip across the ripples till the edge of scan area. The missing static friction peak during detachment suggest a crazing mechanism inside the ripples.

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Jana Hennig studied materials science at Friedrich Schiller University of Jena. She received her M. Sc. degree in 2014 on the preparation and sintering of free standing zinc oxide micro structures. In 2015 she worked on solution processes of phosphate bio glasses at University of Jena before she started her PhD 2016 at Otto Schott Institute of Materials Research in the group of Prof. Enrico Gnecco. During the PhD her research focuses on rippling structures induced by scrapping polymer and glass surfaces. In 2021 she joined the group of Prof. Gianaurelio Cuniberti to continue her PhD.