

Topic: Analytical TEM of amorphous structures

My work is focused on analytical Transmission Electron Microscopy (TEM) studies of different kind of amorphous materials. The TEM is used to investigate the structure of amorphous materials in regards to their chemical composition, their morphological and electronical structure. Especially order in the range of a few nanometer called Medium Range Order (MRO) is an interesting topic for metallic glasses. This kind of order is usually probed using a technique called Fluctuation Electron Microscopy (FEM). FEM is based on acquiring many Nano Beam Diffraction Patterns (NBDP) and gaining information from their speckle intensity.

Amorphous materials which are investigated are for example nanoglasses, a relatively new kind of material produced through compaction of amorphous nanoparticles [1]. During this process two different regions are being formed. On the one hand, the core region which composition is very closely related to that of a rapidly quenched bulk metallic glass with a maximum size of about 15 nm and on the other hand, the interface region with a higher free volume than the core region and also different chemical composition, this region usually does not exceed 2 nm [2].

Another effect which is being investigated is the introduction of Sulphur into a metallic glass system. In what kind of way does the sulfur influence for example the bond structure or the MRO.

[1] Gleiter, H., Th Schimmel, and H. Hahn. "Nanostructured solids–from nano-glasses to quantum transistors." *Nano Today* 9.1 (2014): 17-68.

[2] Ivanisenko, Yulia, et al. "Structure and properties of nanoglasses." *Advanced Engineering Materials* 20.12 (2018): 1800404