Study of natural As_2S_3 glass

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At the burning mine dump of the Lichtenberg open cast, Ronneburg, Thuringia, Germany (mined for uranium-bearing alum shale) and the burning mine dump of the Katerina coal mine, Radvanice, Czech Republic, orange-red to red glassy crusts and droplets with the composition As_2S_3 were found. The material was solidified from a melt, which was probably a sublimation product from a gas phase. X-ray diffraction showed that the material is amorphous. No peaks, but just a flat, very broad hump around d = 5 Å were observed in the diffraction patterns.

To be able to characterize structurally this amorphous mineral, Pair Distribution Function (PDF) analysis has been carried out. Similarly, to previous studies on the synthetic materials (Georgiev et al. 2003), the PDF data show that this mineral is intrinsically phase separated into small As-rich (As_4S_4) and large S-rich clusters. We show in Fig. 1 the PDF fit of the as-collected data using the previously reported model. This result suggests that this new mineral is closely related to the synthetic As_2S_3 glass.

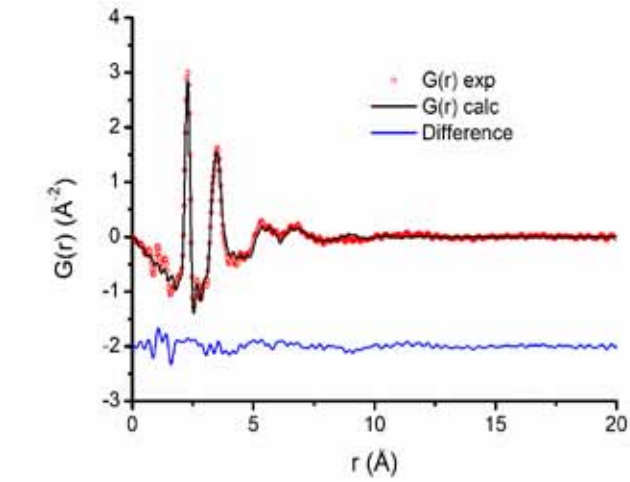

Figure 1: PDF fit of the experimental data using a phase separation model made of As_4S_4 and Sulfur cluster

Georgiev DG, Boolchand P, Jackson KA (2003): Intrinsic nanoscale phase separation of bulk As_2S_3. – Philosophical Mag 83, 2941-2953