**Topic: Mechanical properties of Palladium based bulk metallic glasses**

In 1959 Professor Paul Duwez was the first one to produce amorphous metallic alloys, the metallic glasses. Because of the high cooling rates ($10^6$ K/s) which are necessary to freeze the disordered liquid state to obtain glasses, the samples were only some micrometers thick. Glasses which exceed diameters of 1 mm are called bulk metallic glasses. They were developed by Chen in 1974. Today lots of different metallic glasses are known and bulk metallic glasses with diameters up to 25 mm can be produced.

To describe the deformation of metallic glasses two different modes have to be distinguished. For high temperatures and low stresses homogeneous flow occurs whereas for low temperatures and high stresses the flow becomes inhomogeneous. The latter mode of deformation is in focus of my research. During deformation (e.g. compression, bending) the strain is localised in so called shear-transformation-zones (STZ). Due to the strain accumulation in the STZ shear bands form after a critical shear strain. These shear bands are clearly visible in the Palladium based metallic glass in Figure 2 which was bended in a 3-point bending test. In a 3-point bending test you have tension on the one side of the sample and compression of the other side. Normally bulk metallic glasses show nearly no ductility during deformation. For example in compression test they break catastrophically in mostly one huge shear band in an angle of about 45 degrees. Due to micro alloying plasticity of metallic glasses could be improved for some alloys. In my work I want to investigate one ductile palladium based metallic glass.

I also analysed the hardness of the palladium based metallic glass and the change as a result of deformation (see Figure 1). Especially the hardness of a single shear band I try to measure.

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**Fig. 1:** Hardness-map of a cold rolled Palladium based bulk metallic glass  

**Fig. 2:** 3-point bending test of a Palladium based bulk metallic glass