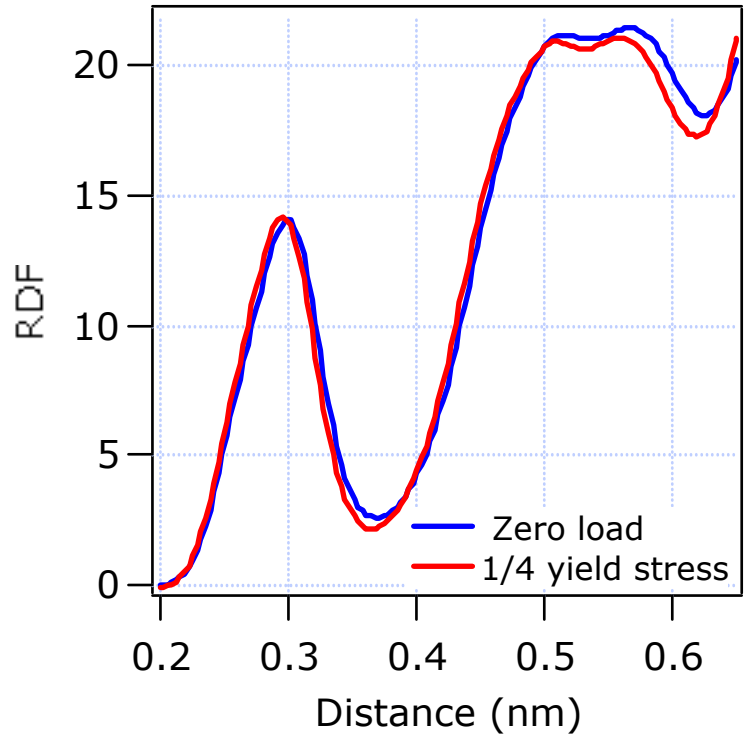
Nanometer-scale Structure and Properties of Metallic Glasses

Todd Hufnagel, Johns Hopkins University, DMR-0307009

Metallic glasses are alloys with a disordered, or amorphous, atomic-scale structure. Even though they are disordered, there is still structure on the nanometer scale, and this structure influences the mechanical properties of the alloy. We are exploring this structure-properties link by using fluctuation electron microscopy and x-ray scattering experiments (to study the structure) along with mechanical testing.



Average local atomic environment in a metallic glass subjected to a compressive stress (red) and under no stress (blue). The stress reduces the average atomic separation, as expected, but also causes more subtle changes in the near-neighbor atomic environment.

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Education:
This program began quite recently (July 2003). A senior graduate student (Ryan Ott) has contributed to our early efforts, and is expected to receive his Ph.D. in 2004. A new graduate student (Stephan Hruszkewcyz) joined the program in Fall, 2003; another student is expected in Fall, 2004.

Outreach:
As with our previous NSF program, we expect to have high school students from Baltimore Polytechnic High School, the local science magnet school, participate in research under this program.

Baltimore Polytechnic High School, the science and engineering magnet school for Baltimore City. Poly has a large population of students from groups under-represented in science and engineering.