

## Electronic Structural Analysis of Refractory Alloy Glasses via Synchrotron Radiation

### Abstract:

Bulk forms of Refractory Alloy Glasses (RAGs) of the composition Ni<sub>60</sub>Nb<sub>37</sub>Sn<sub>3</sub> have recently been synthesized for potential use in structural applications. Modeling efforts of such metallic glasses have traditionally involved the use of hard sphere models without regard to potential electron density fluctuations or changes of individual components. X-ray characterization of these materials provides scattering data necessary for subsequent radial distribution analysis, which gives electronic structure information such as nearest neighbor distances and packing. Small angle x-ray scattering of these materials showed no evidence of long-range order. These samples were also exposed to a 5 to 50 keV white-beam x-ray source in transmission geometry and showed a definite through thickness amorphous structure as indicated by the two-dimensional diffraction patterns captured on Polaroid film. Additionally, diffraction data from a 10 keV monochromatic x-ray source in reflection mode showed similar amorphous patterns. These data were used to calculate the corresponding radial distribution functions (RDFs). For comparison samples of a traditional metallic glass standard, Vitreloy-106 (Zr<sub>57</sub>Nb<sub>5</sub>Cu<sub>15.4</sub>Ni<sub>12.6</sub>Al<sub>10</sub>), of similar thickness were studied using the same experimental techniques. From the RDFs of both of these materials, electronic structure information was obtained.