## Total Scattering: the Key to the Local and Medium Range Structure of Complex Materials

Thomas Proffen, Lujan Neutron Scattering Center, LANL, MS H805, Los Alamos, NM 87545. E-mail: tproffen@lanl.gov

Structural characterization is mainly based on the measurement of *Bragg intensities* and yields the *average* structure of the crystalline material. However, this approach ignores any defects or local structural deviations that manifest themselves as *diffuse scattering*. It also fails in case of disordered materials, badly crystalline such as many nano-materials, or not crystalline at all, such as glasses. In some cases crystalline and amorphous phases coexist making the traditional crystallographic structure refinement difficult or incomplete. The total scattering pattern, however, contains structural information over all length scales [1] and can be used to obtain a complete structural picture of complex materials.

Here we present different applications of this technique including data taken on the new high resolution neutron powder diffractometer NPDF located at the Lujan Neutron Scattering Center at Los Alamos National Laboratory. This instrument is design for total scattering studies using the Pair Distribution Function (PDF) approach. We hope to attract many new users to use total scattering as a tool to fully characterize their materials structurally.

[1] Proffen Th., Billinge S.J.L., Egami T., Louca D., Z. Krist., 2003, 218, 132-143.

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