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Total Scattering: The Key to the Local and Medium Range Structure of Complex Materials. [Th. Proffen](#), Los Alamos National Laboratory, Lujan Neutron Scattering Center, Mailstop H805, Los Alamos, NM 87545.

The key to understanding the properties of complex materials is often an understanding of its local, medium- and long-range atomic structure. Structural characterization is usually 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 a number of examples of this technique to industrially relevant materials.

Th. Proffen, S.J.L. Billinge, T. Egami and D. Louca, *Z. Krist.* 218, 132-143 (2003).