

X-RAY SCATTERING STUDIES ON NANO CRYSTALLINE AND AMORPHOUS MATERIALS USING HIGH-ENERGY X-RAYS ON A LABORATORY SYSTEM

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Recent interest in nano materials has increased the need to analyze structures on a local (nano) scale. However, the atomic structures of nano structured and amorphous materials are not accessible by conventional methods used to study crystalline materials, because of the short ordering range in these materials. One of the most promising techniques to study nano structures using X-ray scattering is by using the total scattering (Bragg peaks and diffuse scattering) from the samples and the pair distribution function (PDF) analysis. The pair distribution function provides information of finding atoms separated by a certain distance. This function is not direction dependent, it only looks at the absolute value of the distance between the nearest neighbors, the next nearest neighbors and so on. The method can therefore also be used to analyze non-crystalline materials.

We have developed the application of PDF analysis on a standard laboratory system employing an X-ray tube with a silver anode as X-ray source. Meaningful results have been achieved on various samples of different nature – crystalline, nano crystalline, amorphous solid and liquid – allowing comparison with data reported in literature, obtained using high-energy synchrotron radiation.