Poster Presentations

[MS27-P10] XPDF @ Diamond: A new dedicated X-ray PDF instrument

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The importance of local structure and disorder in materials is increasingly being recognised as a key property of many functional materials. From negative thermal expansion to solid-state amorphisation and the 'nanoscale' problem to improved fuel cell technology, a clear picture of the local atomic structure is essential to understanding these phenomena and solving the associated problems.

Never has the importance of understanding local structure been so clear in so many disciplines. This means the ability to measure accurate pair distribution function *(PDF)* data is crucially needed, because the technique is the *only* truly quantitative probe of local structure correlations in materials.

Of all the experimental probes of local structure, PDF techniques benefit from the unique advantage that the PDF is a directly-measurable histogram of interatomic distances. Because it is quantitative, it can be used for *local* structure refinement in much the same way as Bragg diffraction patterns are used for *average* structure refinement.

Because the PDF is quantitative it is unique among experimental local structure probes in its ability to *drive* the refinement of structural models. Moreover the models obtained are inherently consistent over different length scales (e.g. with long-range periodicity from diffraction) and other experimental and theoretical information can be readily included in the refinement process. To meet the needs of the growing PDF community and following a successful proposal lead by Dr Andrew Goodwin, a new dedicated X-ray PDF beamline (XPDF) is being constructed at the Diamond Light Source. As such, XPDF will be the first *dedicated* X-ray PDF instrument of its kind in Europe.

The vision for XPDF is straightforward: to build an instrument that measures X-ray PDF data of the highest quality possible at the Diamond Light Source, servicing the very large number of research groups whose work relies on understanding local structure in materials.

How this vision will be realised and the current state of the project will be presented.

Keywords: local structure, materials characterization using X-rays, atomic structure.