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Trends in Inorganic Materials Science: the Role of Diffraction Methods

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Diffraction methods play a central role in the development of new materials and are widely used in combination with other characterization methods to give a detailed understanding of structure-property relationships. We shall discuss several of the current trends in inorganic materials science and examine a number of ways in which diffraction methods can be combined with complementary approaches. In the area of solid state lighting, we shall show how detailed crystallographic studies can be used to better understand the photoluminescent properties of oxide and nitride phosphors [1,2]. For studies on oxides of technetium [3], we shall examine the complementary roles of X-ray and neutron diffraction, EXAFS and density functional theory (DFT). For the characterization of disordered materials and nanoparticles, we shall discuss the use of Pair Distribution Functions (PDFs) compared with conventional Rietveld refinements [4,5]. Finally, we shall look at some of the exciting developments in the field of hybrid inorganic-organic framework structures [6], in particular the characterization of homochiral framework materials by diffraction methods and circular dichroism [7].

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