Editorial

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Biographical notes: Waqar Ahmed is a Chair of Nanotechnology and Advanced Manufacturing at the University of Central Lancashire in the UK. His research interests are in the area of thin solid films and cutting tools. He was educated at Salford University and has held academic positions at the Universities of Northumbria, Manchester and Ulster.

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An interesting variety of papers is presented in this Special Issue of the IJNP. These papers represent novel methods of characterisation, measurement and analysis for increased understanding of nanoparticles. These include the analysis of nanoceramics, nanoreinforced polymer composites and nanofluid systems. A brief summary of some of the contributions is presented below.

Cheng et al. examined the development of nanosized reinforcement of polymer composites. The surface modification of the nanosized dielectric particles was shown to lead to good hydrophobic properties and make resin bond formation with these particles easier. Interesting increases in dielectric constants were noted for the composite despite the addition of lower dielectric constant nanosilica particles. Long chemical chains created, as a result of the surface modifications, in forming the composites were attributed to this result.

A number of dielectric nanoparticles were investigated by Kovalev et al. with various techniques including electron spectroscopy techniques XPS, AES, HREELS and EELFS. The matrix-nanocrystal interface atomic and electronic structure, especially for nanocrystals were determined from the analysis of XPS chemical shifts and vibrational spectra and accommodation strains were determined by EELFS. The powerful use of electron spectroscopy methods were shown to be applicable for chemical and phase composition, electronic structure, distribution of trace elements and point defects measurements.

The analysis of nanosized particle equivalent spherical diameter has been demonstrated by Rafferty et al. using the BET surface area analysis technique. Macro properties of fracture toughness and thermal expansion were also related to nanocrystaline effects in the materials. The dilatometry and DTA techniques were used to determine the temperatures at which the nanosized phase transitions were initiated.

The use of modelling allows us to gain insight into the behaviour of nanocomposities. This is detailed in the paper presented by Vasu et al. A new class of heat transfer fluids is developed by suspending nanosized solid particles in liquids. Multiwalled carbon nanotubes, $Al_2O_{3,}$ and Cu particles can, for example, be suspended in water to provide improved heat transfer. Empirical relations have been determined in this work to account for the effects of temperature, volume fraction and size of these nanoparticles. Sundar and Sharma used the transient hot-wire method to measure heat conductivity in nanofluids. Interesting effects of increased conductivity are indicated with increased temperature and reduced particle size.

The effect of reduced effective mass in nanoparticles is considered in the paper by Muradov. In this work, lattice parameters in the nanoparticles were measured using XRD and the band gaps were measured using a UV-vis spectrophotometer. The reduced effective mass of charge carriers in cadmium sulfide nanoparticles compared to bulk crystals was linked in by this work to changes in their lattice parameters from the centre of the surface.