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EXPERTISE
CRYOGENIC/MAGNETIC MATERIALS/SUPERCONDUCTOR

Dr. Abdul Halim Shaari is currently a Research Fellow in the Department of Physics after his tenureship as Professor of Physics from 1999 to 2015. He obtained his Master's degree in Cryogenics from Southampton University, U.K. in 1978 and a PhD in Magnetic materials in 1981 from University of Hull, U.K. His current research interest is in the interplay between magnetism and superconductivity in the cuprate-manganite systems. Magnetic or superconducting materials are prepared in bulk form with appropriate doping, addition or substitution to see the interplay behaviour. It can also be in thin heterogeneous films or multilayered films prepared via Pulse Laser Deposition (PLD), sputtering or spin coating methods. Another research area of interest is in Multiferroic materials to study the coexistence of ferroelectric and ferromagnetic behaviour. Over 200 research articles have been published.

CURRENT RESEARCH INTEREST:

- **Interplay between magnetism and superconductivity**

Cuprate-based superconducting material and half-metallic ferromagnetic manganite are investigated and the interplay of the two long-range ordering principles – superconductivity and ferromagnetism are studied. The conventional cooper pair is disturbed by the presence of magnetic particles. However the Fe-based superconductor has suggested that there are other mechanisms closely related to magnetism for electron pairing. Thus, looking for superconductivity in the vicinity of magnetism can be an effective search strategy for finding new superconductors.

- **Co-Existance of ferroelectric and ferromagnetic behaviour in multiferroic materials**

Bismuth ferrite ($BiFeO_3$) is the most widely studied multiferroic material having ferroelectricity and antiferromagnetic ordering at room temperature. One of the possible device applications of this material is one that utilizes the ferroelectric/piezoelectric property itself such as ferroelectric memory components, actuators, and so on. Other applications are more challenging and make full use of its multiferroic property to realize novel spintronics and magnetic memory devices, which can be addressed electrically as well as magnetically.

- **Nanoscience**

Synthesis of nanoparticles using low-temperature thermal methods and other wet chemical methods are investigated. Capping agents such as organic ligands, polymers and surfactants are a basic component in the synthesis of metal nanoparticles with controlled size and well-defined shape. The selection of the proper capping agent is a crucial issue for the synthesis of nanoparticles with controlled size, shape and surface-site distribution. PVP plays the role by capping the surface of the particles and reduce the agglomeration of the particles. Yttrium-based, Bismuth-based superconductors and Bi-ferrite multiferroic have been synthesized using thermal method with PVP as capping agent.

LINK TO POSTGRADUATE FIELD OF STUDY:
High Temperature Superconductivity, Multiferroic and Magnetoresistive Materials, Nanoscience

ADDITIONAL INFORMATION:
A home-made PLD system, Ac-susceptibility unit, a four-point resistance, RF-sputtering uint, ESR, vibrating-sample magnetometer (VSM) and Hall-effect unit.