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Investigation on the nature of the verwey transition in Cu-doped Fe₃O₄**Yousef Kareri**

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Magnetite (Fe₃O₄), the oldest known magnet, is still a hotly debated material in scientific research, due to its complex magnetic, electronic and transport properties. One of the most interesting physical phenomena associated with Fe₃O₄ is the occurrence of a metal-insulator transition at ~120 K (TV), the so-called Verwey transition, which is associated to a charge ordering below TV, accompanied with a structural transition from the cubic phase to the monoclinic phase. However, due to the twinning of crystal domain, the detailed crystallographic structure is not fully solved yet and different charge ordered, and bond-dimerized ground states have been proposed. In order to overcome this problem, we have investigated Cu-doped Fe₃O₄ and have determined the stability range of the Verwey phase in the phase diagram of Fe_{1-x}Cu_xFe₂O₄. Using neutron diffraction and high-resolution X-ray synchrotron diffraction we have investigate both the crystallographic and magnetic structure of Cu-doped Fe₃O₄ (Cu_xFe_{3-x}O₄ with x=0 to x=0.95) to elucidate the effect of doping on the Verwey transition. Data obtained from both complementary diffraction techniques indicate that the Verwey transition temperature and the magnetic structure, in particular the magnetic moment remains unchanged up to highest doping levels of 75% Cu-substitution. The large stability range of the Verwey phase is a surprising result and did require a systematic investigation. The analysis of our high-resolution X-ray synchrotron diffraction data in combination with the neutron diffraction data did allow us to extract detailed information on the precise doping mechanism, for example, if the Cu-ions are placed on tetrahedral or octahedral sites in the spinel structure. The obtained diffraction data provide therefore valuable information on the charge order transition, i.e. the Verwey transition.

Biography

Yousef Kareri is student at University of New South Wales, Australia. His research experience includes various programs, contributions and participation in different countries for diverse fields of study. He is a recipient of many awards and grants for his valuable contributions and discoveries in major area of research. His research interests lie in Major areas of Study. He is committed to highest standards of excellence and it proves through his work and experience.

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