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Radiation damage to Fe-superconductors by 1.5 MeV Ar-beam

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Shattering the textbook idea that magnetic impurities destroy superconductivity, the new Fe pnictides superconduct at high temperature up to T_c=56 K. They interestingly lie somewhere between the strongly correlated cuprate and the weakly-correlated conventional supercondcutors. Their fabrication into superconducting wires with fairly high critical current density promise potential use in fusion devices, accelerators etc. So, ion radiation damage investigation is desirable in these materials. Here, ~200 micron thick single crystals of $Ba(Fe_{1-x}Co_x)_2As_2$ for x=0.000 (non-superconducting), and x=0.057 (superconducting with T_c=19.5 K) & 0.102 (superconducting with T_c= 22.5 K) have been produced for studying radiation damage by 55 MeV Li and 1.5 MeV Ar -beams. Damage by the heavier ion, 1.5 MeV Ar-beam, is reported here. The samples have been characterized by Raman Spectroscopy, Photoluminescence Analysis, SEM with EDAX, RBS and X-ray Diffraction. XRD peaks show gradual decrease of the lattice parameter c due to increasing Co-substitution: c=13.0314 Å for x=0.000, c=12.999 Å for x=0.057 & 12.988 Å for x=0.102. Sharp x-ray peaks in the un-irradiated samples broden progressively on irradiation to fluences 0.2×10^{15}, 2.5×10^{15} and 10×10^{15} Ar-ions/cm^2, indicating defect generation. Raman shifts due to these low energy heavy ion irradiations have been significant. Detailed analysis of all results will be presented.

Biography

Udayan De has completed his PhD from IACS, Kolkata, India in 1978. He worked as a Humboldt Fellow in Nuclear Solid State Physics in the University of Erlangen-Nurnberg, Germany. For 1982-2010, he served the Department of Atomic Energy (DAE), Government of India, as a Scientist specializing in Superconductivity, Radiation Damage and other Materials Science topics. Then he has been Guest Professor in Engineering and Science Institutes, and Research Collaborator of DAE and university laboratories. With about 100 journal publications and other papers, he has been PhD guide and PhD examiner for several universities, and also on editorial boards.

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