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A Debate on the Accuracy of the Results from Transmission Electron Microscopy JENNIFER ANAND SUNDARARAJAN, MANINDER KAUR, Q. YAO, YOU QIANG, Physics Department, University of Idaho, Moscow, ID 83844, CHONGMIN WANG, D. RONALD BAER, Pacific Northwest National Laboratory, P.O. Box 999, Richland, WA 99352, CONDENSED MATTER AND NANOPHYSICS RESEARCH GROUP TEAM, ENVIRONMENTAL MOLECULAR SCIENCES LABORATORY COLLABORATION — We studied the effect of thermal and electron beam (E-beam) radiation on the core shell iron-iron oxide Nanoparticles (NPs). Based on atomic level imaging, electron diffraction, and computer simulation, we have direct evidence that the protecting oxide layer formed on the NPs at room temperature in air or oxygen continues to grow during an E-beam bombardment in the vacuum system transmission electron microscopy (TEM). The oxide layer increases from 3 to 6 nm following 1 hour E-beam exposure with an electron ?ux of 7×10^5 $nm^{-2}s^{-1}$ and a vacuum of 3×10^5 Pa. We found that the observed growth is related to E-beam facilitated mass transport across the oxide layer by a defect related process. We show the theoretical proof of defect formation in metal due to E-beam radiation, thereby debating on the accuracy of the result from TEM or any microscope which uses electron for scanning and imaging. This research is supported by DOE-AFCI (DE-FC07-08ID14962) and DOE-BES (DE-FG02-06ER15777).

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