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In-situ transmission x-ray microscopy study of photon-induced oxidation of silver nanowires LE YU, Department of Physics, Bryn Mawr College; School of Electronic Science and Engineering, Nanjing University, China, YUGANG SUN, Center for Nanoscale Materials, Argonne National Laboratory, YUXIN WANG, ZHONGHOU CAI, X-ray Science Division, Advanced Photon Source, Argonne National Laboratory, PING HAN, School of Electronic Science and Engineering, Nanjing University, China, X.M. CHENG, Department of Physics, Bryn Mawr College — Oxidation of metal nanoparticles usually follows a Kirkendall process to transform solid nanoparticles to hollow metal oxide nanoshells. However the morphological trajectory of nanoparticles and the mass diffusion kinetics involved in the nanoscale Kirkendall process are complex. In this presentation we report the use of in-situ transmission x-ray microscopy (TXM) to directly image individual silver nanowires under oxidation atmosphere, which are created from radiolysis of air under illumination of the focused synchrotron x-ray beam. The in-situ results clearly show the morphological transformation from solid silver nanowires to hollow nanotubes in the course of oxidation reaction of silver. Quantitative analysis of the time-resolved TXM images provides unprecedented details on reaction kinetics and mass diffusion kinetics associated with the oxidation process. Work at Bryn Mawr College is supported by NSF grant #1207085. Use of the Advanced Photon Source and the Center for Nanoscale Materials at Argonne National Laboratory was supported by the U. S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

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