In Situ Synchrotron XRD Studies of Microstructure Evolution During the Salt-Mediated Coarsening of Nanoporous Metals

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Conversion reaction synthesis (CRS) provides a versatile, scalable route to nanoporous metals (NPMs) desirable for catalysis due to their high surface area. Precise control of porosity through annealing is needed to achieve application-specific morphologies. CRS-NPMs often collapse when annealed, so they are instead heated as a CRS intermediate nanocomposite in which salt fills the NPM pores. In situ synchrotron annealing studies were used to quantitatively follow the rapid evolution in microstructure. Rapid metal particle growth is concurrent with a sharp reduction in salt lattice strain, indicating the solid salt has a non-innocent role in coarsening. This work provides the first kinetic and mechanistic insights to coarsening in CRS-NPMs.