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**X-ray imaging of nickel-based microstructured superalloys using synchrotron radiation** NAJI HUSSEINI, DIVINE KUMAH, CODRIN CIONCA, ROY CLARKE, Physics Department, University of Michigan, JIANZHANG YI, CHRISTOPHER TORBET, J. WAYNE JONES, Material Science and Engineering, University of Michigan — Nickel-based superalloys are used in harsh environments such as airplane turbines and nuclear power plants for their high temperature stability and resilience to oxidation and corrosion. These superalloys grow via directional solidification along the <001> orientation and assume a dendritic morphology along <100>, concentrating Ni into the dendrites and TaC elsewhere. 200 $\mu$m thick samples of Rene N5 were imaged in a transmission setup at Sector 7 of the Advanced Photon Source with high-intensity synchrotron radiation. The recorded intensity maps contain information about the elemental concentration with sub-micron resolution, enhanced by phase contrast near sharp compositional variations. These maps show vacancies and cracks in addition to linearly decreasing concentrations of Re and W out from the center. Interferences seen while rotating the sample reveal misorientations of the cores and strain between dendrites, while a full rotation permits 3D tomography. One-second exposure times allow observation of *in situ* crack propagation induced by an ultrasonic fatiguer.

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