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Diffuse x-ray scattering study of vacancy nanoclusters incorporated into thin Ag(001) homoepitaxial films[1] SHAWN HAYDEN, U Missouri-Columbia, CHINKYO KIM, Kyunghee U, CRAIG JEFFREY, U Missouri-Columbia, RUI FENG, EDWARD CONRAD, Georgia Inst Tech, PHILIP RYAN, MUCAT, APS, Argonne Nat Lab, MICHAEL GRAMLICH, PAUL MICELI, U Missouri-Columbia — In situ diffuse x-ray scattering was used to investigate vacancies that are incorporated into Ag films on Ag(001). Knowledge of the kinetic pathways through which these vacancies are incorporated is fundamental to our understanding of how films and nanostructures grow at the atomic scale. Unexpectedly large vacancy clusters having a volume of 750 ang^3 were observed in 100 ML films grown at 150K. Vacancy clusters are also found to incorporate at 300K where the films grow layer-by-layer. Studies of thinner films (5, 10, 20 ML grown at 150K) indicate that the vacancy clusters begin their formation immediately upon deposition and that the vacancies, once initiated, are stable to both their enlargement and subsequent burial. This has important implications for the mechanisms that control the growth and organization of nanostructures.

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Paul Miceli
University of Missouri-Columbia

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