**46c** in Situ Transmission Electron Microscopy Studies of Vapor-Liquid-Solid Phase Growth of Si Nanowires [Invited]

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Using ultra-high vacuum transmission electron microscopy (UHV-TEM), we study the growth kinetics of Si nanowires deposited in situ on Au-covered Si(111) substrates from disilane (~ 10-6 Torr) at temperatures between 773 K and 950 K. We observe, in real-time, the growth of <111>-oriented Si wires in the presence of molten Au-Si eutectic droplets serving as the catalysts. From the TEM images of individual Si wires, acquired at video rates, we measure time-dependent changes in lengths and diameters of the wires and volumes of the Au-Si droplets. We find that the lengths of all wires increase linearly with deposition time at a temperature-dependent constant rate that is independent of the droplet diameter. Volumes of all the droplets decrease with time during both deposition and annealing in vacuum. We attribute this behavior to loss of Au due to surface diffusion along the wires and wetting of wire surfaces. Exposing the samples to O2 during deposition, prevents loss of Au from the droplets and favors the growth of <110>-oriented Si wires. Our results provide insights into mechanisms governing the kinetics of Si nanowire growth.