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Nucleation of Nb3Sn films in a tin vapor diffusion process

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The tin vapor diffusion coating of Nb cavity interiors via a two-step nucleation-then-growth sequence appears to be the most promising path so far to produce Nb3Sn cavities. To elucidate the role of nucleation, we manipulated the accessible range of process variables and studied the niobium surface nucleated under varying process conditions using an array of materials characterization tools. Broadly, nucleation deposits tin as a thin surface phase and, under some conditions, as near-micron sized particles as well. Conditions that impair nucleation promote the formation of defects, such as patches, in subsequent coating growth. This presentation discusses the nucleation stage in a typical vapor diffusion coating in practice to produce Nb3Sn-coated SRF cavities.

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