Surface Phase Diagram of Nb$_3$Sn(100) surface

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Nb$_3$Sn is a potential candidate for use in the superconducting radiofrequency (SRF) particle accelerator cavity application. Its use in the SRF cavity has been hindered by the challenges involved in coating the Nb cavity with Nb$_3$Sn. The surface structure of the deposited Nb$_3$Sn determines the superconducting properties of top surface layers and, in turn, the performance of SRF cavities. Hence it is desirable to understand the relationship between experimental parameters used in the Nb$_3$Sn vapor deposition process and the structure of the deposited layer. In this poster, I will present our work on using genetic algorithms coupled with density functional theory calculations for constructing the pressure-temperature surface phase diagram of the Nb$_3$Sn(100) surface. This surface phase diagram will help optimize the vapor deposition recipes of Nb$_3$Sn.