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Comparison on the superconducting properties of Nb and NbTiN thin films produced by both HiPIMS and bipolar HiPIMS

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Most superconducting thin films found on SRF cavity are generally produced through magnetron sputtering using niobium (Nb) as target. Yet, this technique can still be improved as the resulting film lack in efficiency. Alternative materials such as NbTiN could potentially be used with significant improvement compared to pure Nb films. Here, we report the use of both high-power impulse magnetron (HiPIMS) and bipolar HiPIMS to produce superconducting thin film, with a particular attention on the optimal conditions to enhance the film growth highly dependent on the pressure and power conditions. We used both mass spectroscopy and a retarding field analyzer to analyze the plasma chemistry providing information on the mass/energy of the ions formed. The surface of the resulting films was analyzed by XPS and SEM and their superconducting properties were characterized by measuring the T_c , RRR and low RF.

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