SRF2025 TOKYO
22ND INTERNATIONAL CONFERENCE ON RF SUPERCONDUCTIVITY
September 21-26, 2025

Contribution ID: **160** Contribution code: **THP23** Type: **Poster Presentation**

Fabrication of 1.3 GHz MgB2 superconductor-on-copper cavity using hybrid physical-chemical vapor deposition

Thursday 25 September 2025 14:30 (3 hours)

Superconductor MgB2 has a Tc of 40 K, and its materials parameters suggest that SRF cavities with higher Q, higher gradient, and higher operation temperatures than Nb cavities can potentially be made from MgB2. We present our ongoing efforts towards the development of MgB2-coated SRF cavities. Thick MgB2 films, up to 5 um in thickness, were deposited onto 1.3 GHz Tesla-type copper RF cavities using a hybrid physical-chemical vapor deposition (HPCVD) process. The mock cavities were fabricated through deep drawing. A pair of clamshell resistive heaters was employed for heating the cavity during the coating. MgB2 films grown on 1 cm × 1 cm copper substrates attached to the inner wall of the cavities exhibited a critical temperature of up to 38 K, as determined by AC susceptibility measurements. Uniform MgB2 film coatings were achieved by moving the Mg and B source in tandem with computerized control of deposition parameters, including cavity temperatures and gas flow rates. The MgB2 films were also characterized by RF surface resistance measurements.

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Footnotes

Funding Agency

This work was supported by the U.S. Department of Energy, Office of Science under Grant DE-SC0022330.

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Session Classification: Thursday Poster Session

Track Classification: MC2: Fundamental SRF research and development