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M3Or1C-04: Development of MgB₂/Cu cavities by HPCVD

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MgB₂ is a promising superconductor to replace Nb for SRF cavities. Clean MgB₂ thin films have a low residual resistivity ($<0.1 \mu\Omega\text{cm}$) and a high T_c of 40 K, promising a low BCS surface resistance. Its thermodynamic critical field H_c is higher than Nb, potentially leading to a higher maximum accelerating field. The lower critical field H_{c1} of MgB₂ is lower than Nb, but it can be enhanced by decreasing the film thickness. MgB₂ coated Cu cavities have an added advantage from the high thermal conductivity of Cu, which will enhance the heat transfer from the MgB₂ layer, improving the cavity's resistance to "quenching." MgB₂ coated Cu cavities working at 20 - 25 K will eliminate the need for liquid He refrigeration. In this talk, the latest results of research at Temple University on the coating of mock 3.9 GHz Cu cavity by hybrid physical-chemical vapor deposition (HPCVD) will be presented. Materials issues involved in MgB₂ thin films on Cu will also be discussed. The preliminary cavity measurement showed superconducting transition of the MgB₂ coating, but the poor continuity of the coating resulted in high loss. Further improvement of the coating property is needed to achieve practical MgB₂/Cu cavities.

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