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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 μΩcm) and a high Tc of 40 K, promising a low BCS surface resistance. Its thermodynamic critical field Hc is higher than Nb, potentially leading to a higher maximum accelerating filed. The lower critical field Hc1 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.

Primary authors: Prof. XI, Xiaoxing (Temple University); CHEN, Ke (Temple University)

Presenter: CHEN, Ke (Temple University)

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