

Local Magnetic Investigations of MgB₂ Bulk Samples for Magnetic Shielding Applications

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Abstract - A local magnetic characterization of disk-shaped MgB₂ bulk samples synthesized by the Spark-Plasma-Sintering technique was carried out aimed at studying the material magnetic shielding properties. This growth technique allows one to produce samples in different shapes and sizes as required for shielding applications. The analysis employed a linear array of Hall probes mounted on a custom-designed stage able to move perpendicular to the sample surface with micrometric resolution. Spatial distributions of the axial component of the shielding magnetic-induction field generated by the superconductor were evaluated in the temperature range 20-36 K and in applied magnetic field up to 1.5 T. By the analysis of these shielding field profiles in the framework of the critical state model, critical current densities, J_c , higher than 10^{10} A/m² were found at T = 20 K. On the basis of the found J_c values a preliminary estimation of the full penetration field inside a tube-shaped shield component was carried out. It indicates that the material under test is a good candidate for passive magnetic shields.

Index Terms - Local magnetic analysis, Magnetic shielding, MgB₂, Critical current density

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