# Reaction method control of impurity scattering in C-doped MgB2: proving the role of defects besides C substitution level

## ABSTRACT

In this study, Si and C were incorporated into polycrystalline MgB 2 via in situ reaction of Mg and B with either SiC or with separate Si and C (Si+C). The electrical transport and magnetic properties of the two series of samples were compared. The corrected resistivity at 40 K, ρA(40 K), is higher for the samples reacted with SiC regardless of the carbon (C) substitution level, indicating larger intragrain scattering because of the simultaneous reaction between Mg and SiC and carbon substitution during the formation of MgB2. In addition, because of the cleaner reaction route for the samples reacted with SiC, the calculated active area that carries current, AF, is twice that of the (Si+C) samples. On the other hand, the upper critical field, Hc2, was similar for both sets of samples despite their different C substitution levels, which proves the importance of defect scattering in addition to C substitution level. Hence, the form of the precursor reactants is critical for tuning the form of Hc2(T).

**Keyword:** MgB2; Carbon doping; Upper critical fields; Carbon substitution; Control of impurities; Defect scattering.