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High-field measurements on bulk $YBa_2Cu_3O_y$ samples prepared by the Infiltration-Growth (IG) technique

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With the objective to concurrence the well-known melt texturing YBCO samples in term of irreversible field and critical current, infiltration growth YBCO bulks (IG-processed) show a recent increase of interest due to their advantage of better controlling the shape of the final product and better mechanical stability. Two types of IG-processed YBCO samples were developed: standard bulk samples and superconducting foams which show the advantage of a huge cooling capacity and a low weight due to his low density, particularly appreciated for space applications.

Intended for use as permanent superconducting magnets (trapped field (TF) magnets), precedents works were done to evaluate the pinning properties of such materials by pinning force scaling (Dew-Hughes and Kramer) but only under relatively low magnetic field (up to 9 T). Considering a very high irreversible field (H_{irr}), even at 77 K, a lot of assumptions and extrapolations were needed.

Small pieces of both designs (standard bulk and foam) were cut and mechanically polished (1 x 1 x 0.1 mm^3) according to the crystallographic orientation (H // c). To experimentally determine the pinning properties for magnetic field above 9 T, we were able to make measurements at high magnetic field (above 30 T) for different temperatures between 85 K and 40 K with the help of EMFL facilities using Cantilever Torque Magnetometry at the High Magnetic Field Laboratory of Nijmegen.

Keywords: IG-processed YBCO, Material characterization, superconducting Bulks, High field measurements