

AFM analysis of melt-textured YBCO with nanoscale inclusions

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Y-Ba-Cu-O (YBCO) is the best suited high- T_c superconductor for bulk applications, but a higher critical current density would be desirable. To achieve this goal, attempts have been made to refine the size of the embedded Y_2BaCuO_5 (Y-211) particles within the superconducting $YBa_2Cu_3O_{7-\delta}$ (Y-123) phase matrix. However, these particles are generally too big to be effective flux pinning sites, except in low fields. Furthermore, there is a negative influence of these particles on the growth of the superconducting Y-123 matrix. Recently, particles with the composition $Y_2Ba_4CuMO_x$ where $M = U, Nb, Zr$, etc., and sizes in the range 10 – 50 nm have been generated within the YBCO matrix. By means of AFM measurements, we analyse the spatial distribution and the size distribution of these particles. The resulting critical current densities were determined magnetically and magneto-optically.

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