

Nanoscale stripe structures in $\text{SmBa}_2\text{Cu}_3\text{O}_x$ superconductors

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AFM and STM scans on $\text{SmBa}_2\text{Cu}_3\text{O}_x$ (SmBCO) melt processed samples revealed nanoscale stripe-like structures, sometimes parallel over several micrometers, sometimes wavy. These structures consist of chemical compositional fluctuations and act as effective δT_c pinning centres due to their wavelength of typically 10-60 nm which is comparable to the ideal pinning center size 2ξ (~ 10 nm for $\text{YBa}_2\text{Cu}_3\text{O}_x$ in the ab-plane). Compared to similar structures in ternary (Sm,Eu,Gd) $\text{Ba}_2\text{Cu}_3\text{O}_x$ (SEG) and (Nd,Eu,Gd) $\text{Ba}_2\text{Cu}_3\text{O}_x$ (NEG) systems, where the stripes appear either as plateau-like stripes or as chains of aligned clusters, the stripes in SmBCO always appear as plateau-like stripes with a height of $1\text{Å} - 8\text{Å}$. These pinning structures throughout the whole sample volume may be a key to improve critical current densities especially at high external magnetic fields.

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