

Suppression of the critical current at grain boundaries of high-temperature superconductors

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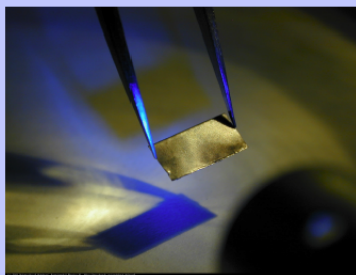
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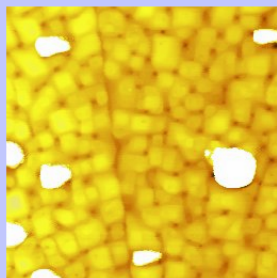
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- Critical current in wires and tapes made from high- T_c superconductors is limited by grain boundaries

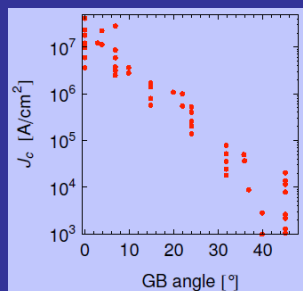


RABiTS band kept by tweezers



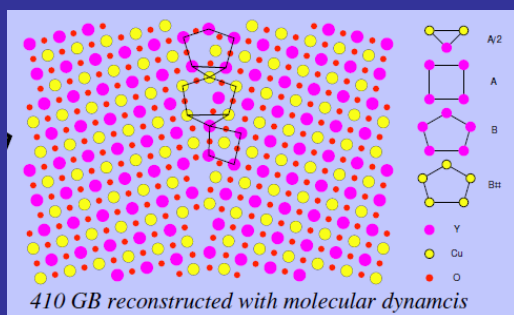
AFM image of on YBCO grain boundary

- Critical current depends exponentially on misorientation angle and is reduced by more than 3(!) orders of magnitude at 45° GBs



Critical current as a function of misorientation angle, measured in artificially fabricated YBCO grain boundaries *Rev. Mod. Phys.* 74, 485 (2002). from H. Hilgenkamp & J. Mannhart,

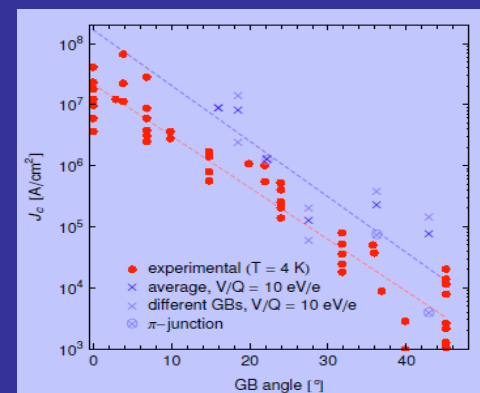
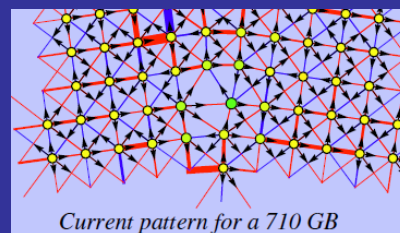
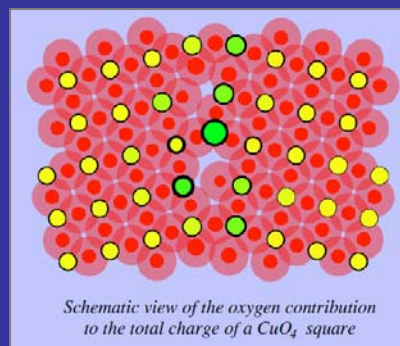
Grain boundary reconstruction



- TEM images of GBs reveal atomic scale reconstruction and characteristic structural units at large angle GBs

- Molecular dynamics with enforced misalignment angle can be used to determine ionic positions

Bogoliubov-de Gennes description



- Charging of interface due to defects similar to classical dislocation cores gives exponential dependence of critical current on θ (see also Gurevich and Pashitskii 1998).