

The Physics of Intrinsic Josephson Junctions

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In this presentation I will first briefly review some of the seminal research works involving intrinsic Josephson junctions (IJJs) forming in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$ single crystals, including Shapiro steps observed both in the surface and the inner IJJs which is related to the development of voltage-standard devices, Coulomb blockade effect in ultrasmall junctions, high- T_c IJJ SQUID device, tunneling spectroscopy using IJJs to study the pseudogap state of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$ material above T_c . I will then concentrate on my own research results on the dynamics of magnetic-field-generated Josephson fluxons in stacked IJJs especially prepared by the “double-side-cleaving” technique, which is directly related to the development of THz oscillator devices. Effect of spin-polarized current injection into IJJs and the resultant weakening of superconductivity in CuO_2 double layers as well as the interlayer Josephson coupling will also be briefly discussed in terms of c-axis spin diffusion.

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