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Damping of spin waves in the spin polaron theory

The damping of spin waves in high-Tc cuprate superconductors was analytically calculated using the spin polaron formulation in the finite temperature Green's function scheme. This representation describes holes as spinless fermions and spins as normal bosons which are characterized by hard core bosonic operators obtained using the Holstein-Primakoff transformation. The interaction between the holes and spins are described by the spin polaron Hamiltonian which resembles the classic polaron interaction Hamiltonian. The expression for the attenuation of spin wave was obtained by calculating the second-order spin wave self-energy and taking its imaginary component where it involves taking the spectral function of the hole and spin wave Green's functions and a summation over the Matsubara frequencies. The rate of attenuation of spin waves was also obtained for a system with zero temperature and a low frequency limit.

Primary authors: Dr ONG, Perkins Jon (University of San Carlos); Dr YANGA, Danilo (University of San Carlos)

Presenter: Dr ONG, Perkins Jon (University of San Carlos)

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