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Is Sr2VO3FeAs a New Paradigm for Fe-based Superconductors?

IGOR MAZIN, Naval Reserach Laboratory — One of the most popular scenarios for the superconductivity in Fe-based superconductors (FeBSC) posits that the bosons responsible for electronic pairing are spin-fluctuations with a wave vector spanning the hole Fermi surfaces (FSs) near Γ and the electron FSs near M points. So far all FeBSC for which neutron data are available do demonstrate such excitations, and the band structure calculations so far were finding quasi-nested FSs in all FeBSC, providing for a peak in the spin susceptibility at the desired wave vectors. However, the newest addition to the family, Sr_2VO_3FeAs, has been calculated to have a very complex FS with no visible quasi-nesting features. It was argued therefore that this material does not fall under the existing paradigm and calls for revisiting our current ideas about what is the likely cause of superconductivity in FeBSC. I show that the visible complexity of the FS is entirely due to the V-derived electronic states. Assuming that superconductivity in Sr_2VO_3FeAs, as in the other FeBSC, originates in the FeAs layers, and the superconducting electrons are sensitive to the susceptibility of the FeAs electronic subsystem, I recalculate the bare susceptibility, weighting the electronic states with their Fe character, and obtain a susceptibility that fully supports the existing quasi-nesting model. I also present results of magnetic calculations with 5 different patterns and discuss possible peculiarities of the spin fluctuation in this system.

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