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Superconductivity in $\mathbf{K}_x\mathbf{Fe}_{2-y}\mathbf{Se}_{2-z}\mathbf{S}_z$[1]

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Single crystal alloys $KxFe_{2-y}Se_{2-z}S_z$ offer valuable insight into the strength of electronic correlations in the normal state and structural characteristics associated with superconductivity. I will discuss the evolution of the superconducting and magnetic ground states as a function of sulfur concentration z and some noticeable changes in the average and local crystal structure associated with this [1-4]. Conductivity and magnetic properties coincide with stoichiometry changes and with particular local environment of Fe atoms on the two Fe sites in the crystal structure. The ratio of superconducting T_c and Fermi temperature T_F is also suppressed by sulfur doping, indicating the suppression of electronic correlations. The superconductivity persists with relatively high T_c even when electronic correlations in the normal state are greatly reduced. The results for z = 0 will be compared with other experimental techniques that probe nanoscale phase separation and degree of vacancy order [5-6]. It will be shown that local structure and population of particular Fe sites is rather important for obtaining the bulk superconducting phase. Superconducting volume fraction and homogeneity of superconducting phase is in direct competition with Fe vacancy order [7].

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