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Electronic properties of α-$FeSi_2$ – single crystal study[1] WOJCIECH MIILLER, Stony Brook University, JAN TOMCZAK, Rutgers University, JACK SIMONSON, GREG SMITH, Stony Brook University, MEIGAN ARONSON, Stony Brook University and Brookhaven National Laboratory — The discovery of high temperature superconductivity (HTS) in Fe pnictides has simulated a lot of work in field of Fe-based materials. We focus on the tetragonal (high-temperature) form of the iron disilicide, which crystal structure resembles one of the HTS, LiFeAs (T_{sc} =18 K). Single crystals of α-$FeSi_2$ with $Fe_{0.83}Si_2$ composition were grown and magnetic, transport and heat capacity studies were performed in consistent way. Magnetic susceptibility of α-$FeSi_2$ increases in a linear fashion with increasing temperature, as was commonly observed among Fe HTS. In a contrast to superconducting pnictides, where $\chi(T) \sim T$ is associated to antiferromagnetic fluctuations, in α-$FeSi_2$ this behavior is rather related to the electronic structure of this metal. In Fe-based HTS proximity of the SDW instability seems to be crucial for the emergence of superconducting state – in α-$FeSi_2$ the experimental data do not find evidence for any strong electronic correlations. Our LDA and DMFT calculations results find low density of states, supporting weakness of correlations and suggest electronic configuration of Fe close to d^6.

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