

Abstract Submitted  
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**Superconductivity enhanced by Se-doping in  $\text{Eu}_3\text{Bi}_2\text{S}_4\text{F}_4$**  PAN ZHANG, HUI-FEI ZHAI, GUANGHAN CAO, ZHUAN XU, Department of Physics, Zhejiang University — We investigated the negative chemical pressure effect of  $\text{Eu}_3\text{Bi}_2\text{S}_4\text{F}_4$  by partially substituting S with Se. The “parent” compound  $\text{Eu}_3\text{Bi}_2\text{S}_4\text{F}_4$  is a new member of the  $\text{BiS}_2$ -based superconductors. [H.F. Zhai et al., J. Am. Chem. Soc. 136, 15386–15393, (2014)] It shows anomalous Eu valence and superconductivity of  $T_c = 1.5$  K without chemical doping. With S/Se-doping, we found that a CDW-like anomaly is gradually suppressed to lower temperatures, and meanwhile the superconductivity (SC) is enhanced. For  $\text{Eu}_3\text{Bi}_2\text{S}_2\text{Se}_2\text{F}_4$ ,  $T_c$  reaches 3.4 K. Magnetization measurements reveal an average Eu valence of  $\sim 2.06$ , which means that Se doping does not introduce extra electrons but instead, lowers down to a low electron doping level of  $x \sim 0.1$ . Therefore, the present system manifested itself as a rare example of existence of SC at very low doping levels.

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