

## Phase diagram of the $\text{SmFe}_{1-x}\text{Co}_x\text{AsO}$ ( $0 \leq x \leq 1$ ) system

Y. K., J. Tong, X. Lin, Q. Tao, G. H., and Z. A.

Department of Physics, Zhejiang University, Hangzhou 310027, China

A series of the  $\text{SmFe}_{1-x}\text{Co}_x\text{AsO}$  ( $0 \leq x \leq 1$ ) samples are synthesized and the evolution of electronic state with Co content is investigated. As well known, the parent compound ( $x = 0$ ) undergoes a SDW transition of Fe 3d electrons around 140 K and an antiferromagnetic (AFM) ordering of Sm 4f electrons at 5.6 K. Even 5% Co doping severely suppresses the SDW transition to a very lower temperature, and meanwhile, superconductivity appears with  $T_c$  of 8 K. With increasing Co content,  $T_c$  (midpoint in resistivity) reaches a maximum value of 17.2 K at  $x = 0.1$ , and a narrow superconducting (SC) regime with ( $0.05 \leq x \leq 0.2$ ) is identified. On the other hand, the AFM order of Sm 4f electrons is robust in the whole Co doping range, and its Neel temperature  $T_N$  slightly decreases in the intermediate doping range ( $0 \leq x \leq 0.7$ ), and then it increases to 5.6 K at  $x = 1$ . Around  $x = 0.7$ , there is a transition from paramagnetic to ferromagnetic (FM) order of Co/Fe 3d electrons. Furthermore, an antiferromagnetic transition of Co/Fe electrons occurs at a lower temperature probably due to the interaction between Co 3d electrons and Sm 4f electrons. For the other end compound ( $x=1$ ),  $\text{SmCoAsO}$  shows a FM transition around 80 K, and an AFM transition around 45 K, and finally an AFM order of Sm 4f electrons at 5.6 K. Based on those results, an electronic phase diagram of the  $\text{SmFe}_{1-x}\text{Co}_x\text{AsO}$  ( $0 \leq x \leq 1$ ) systems is established.