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Transport signature of spin gapless semiconducting properties in quaternary Heusler of CoFeCrAl GUIZHOU XU, XIAOMING ZHANG, ENKE LIU, WENHONG WANG, GUANGHENG WU, Institute of Physics, Chinese Academy of Sciences, INSTITUTE OF PHYSICS TEAM — Spin gapless semiconductors (SGS), since proposed by Wang in 2008, have attracted intensive attention due to its potential application in spintronics. In our previous works, we have predicted some quaternary Heusler alloys are promising to be candidates of SGS. In this presentation, we will report the transport signature of SGS properties for CoFeCrAl, one of SGS candidate. The results show that samples treated in different ways can present distinguished transport properties. On the one hand, the arc-melted bulk samples exhibit a negative temperature dependence of resistivity accompanying with a negative magnetoresistance from 5-300K, revealing a normal transport behavior signifying for a metallic magnetic system. On the other hand, for the melt-spun ribbon samples, a positive temperature dependence of the resistivity as well as positive sign of magnetoresistance were observed, which implies that a semiconducting-like transport mechanism dominate in this sample. Based on our first principles analysis, this difference can be attributed to the occurrence of anti-site occupation between Co/Cr atoms in the compound. Our findings raised the possibility to tune the properties of SGS through proper sample treatments due to its atomic-occupation sensitivity.

Guizhou Xu
Institute of Physics, Chinese Academy of Sciences

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