Electronic chirality observed at the atomic scale

Chemical doping in materials is known to give rise to emergent phenomena. LSU researchers from Department of Astronomy and Physics, working with scientists from Oak Ridge National Laboratory reported in ***Nature*** *Scientific Reports* (vol. 3, 2882 (2013) observation of electronic chirality associated with Mn doping in $Sr_3(Ru_{1-x}Mn_x)_2O_7$.

$Sr_3(Ru_{1-x}Mn_x)_2O_7$ is a double -layer perovskite with building blocks formed by $(Ru/Mn)O_6$ octahedra, with SrO spacer layers, as shown in Fig. 1a. The $(Ru/Mn)O_6$ octahedra are rotated in the bulk creating a structure shown in Fig. 1b—with two different Ru sites in the basic structural building block (green square), one rotated clockwise the other counter-clockwise. The sample cleaves at the SrO plane producing atomically resolved STM images as shown in Fig. 1c and 1d. The bright ordered array is from the Sr atoms and the almost square regions are associated with Mn atoms in the second layer (x=0.06). Statistics shows that they are randomly distributed, but enlarged images like the one in Fig. 1d reveals a clockwise and counter-clockwise chirality associated with the two different sites shown in Fig. 1b. The size of the observed electronic disturbance is a function of Mn doping. These results serve as fingerprint of effect of chemical doping on the atomic scale and will lead to understanding on an atomic level of the effect of doping in this class of materials.

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269. Paper "Atomic-Scale Fingerprint of Mn Dopant at the Surface of $Sr_3(Ru_{1-x}Mn_x)_2O_7$" Guorong Li, Qing Li, Minghu Pan, Biao Hu, V. B. Nascimento, Chen Chen, Jing Teng, Jiandi Zhang, Rongying Jin, and E.W. Plummer, *Scientific Reports, Nature,* **3**, 2882 (2013).