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Surface Bilateral Symmetry on Orthorhombic Double-layer $\mathbf{Sr_3(Ru_{1-x}Mn_x)_2O_7}$[1] CHEN CHEN, JIANDI ZHANG, RONGYING JIN, WARD PLUMMER, Louisiana State University — The double-layered ruthenate $Sr_3Ru_2O_7$ exhibits very interesting properties especially on the surface because of the broken symmetry (G. Li *et. al.*, Scientific Reports 3 2882 (2013)). Compared to the bulk, the surface not only enhances the octahedral rotation but also introduces tilt (not in the bulk). Partial substitution of Mn for Ru reduces the tilt distortion while keeps the rotation angle constant up to $\sim 20\%$ doping. Tilt distortion as expected removes one of the glidelines (associated with rotation) and breaks the mirror symmetry along this broken glideline in the LEED pattern, resulting in a "bilateral symmetry" as a prefect human has. It is surprising that the surface has lost much of the symmetry present in the bulk. When the tilt is removed by increased Mn doping (x) in $Sr_3(Ru_{1-x}Mn_x)_2O_7$ the LEED pattern returns to the expected one with two glide planes. In comparison, the LEED pattern of single layer $Ca_{1.9}Sr_{0.1}RuO_4$ which has tilt still preserves the mirror symmetry. We assign this difference to the different structures in the first and second octahedral layers.

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Chen Chen
Louisiana State University

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