Electronic structure of two-dimensional CoO_2

Charlotte Sanders, Ann Julie Holt, Sahar Pakdel, Jonathan Rodríguez-Fernández, Yu Zhang, and Davide Curcio

Science & Technology Facilities Council, UK

The transition metal oxide CoO_2 forms layered bulk "pseudo-two-dimensional" structures that exhibit correlated electronic states and a complex interplay between superconductivity and charge/spin ordering. Recently, it has been shown [1] that CoO_2 can be stabilised in the single-layer limit. However, little has been known about the single layer's electronic structure. We have now studied the crystalline and electronic structure of single-layer epitaxial CoO_2/Au(111). Angle-resolved photoemission spectroscopy (ARPES) reveals a band structure with important similarities to that of the superconducting layered bulk material $Na_{0.35}CoO_2 \bullet 1.3H_2O$. Using x-ray photoelectron diffraction, we have obtained detailed information about the crystal structure, and have used this information as a basis for density functional theory calculations to support the interpretation of our ARPES data. The results emphasise the interest of oxides as a new subject within two-dimensional materials research. They also contribute to our understanding of the electronic properties of layered bulk crystals based on CoO_2. [1] ACS Nano **9** (2015) 2445.