Two-dimensional diboron trioxide crystal composed by boroxol groups

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Diboron trioxide (B_2O_3) represents an unusual case among polymorphic oxides, for its vitrified state features superstructural units – planar boroxol groups, B_3O_6 [1,2] – that are never observed in its three-dimensional crystalline polymorphs. Crystalline polymorphs that incorporate boroxol groups have only been predicted theoretically [3], although their formation is crucial to rationalize the ability of B_2O_3 to vitrify. Here we present the synthesis of a two-dimensional crystalline B_2O_3 polymorph constituted by boroxol groups arranged in an atomically thin honeycomb lattice. By combining surface science experimental techniques with ab initio calculations, we characterize the structural and electronic properties of this B_2O_3 polymorph down to the atomic level [4]. This discovery enlarges the family of two-dimensional materials and enables the atomic tracking of individual structural units in trioxides.

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References

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Figures

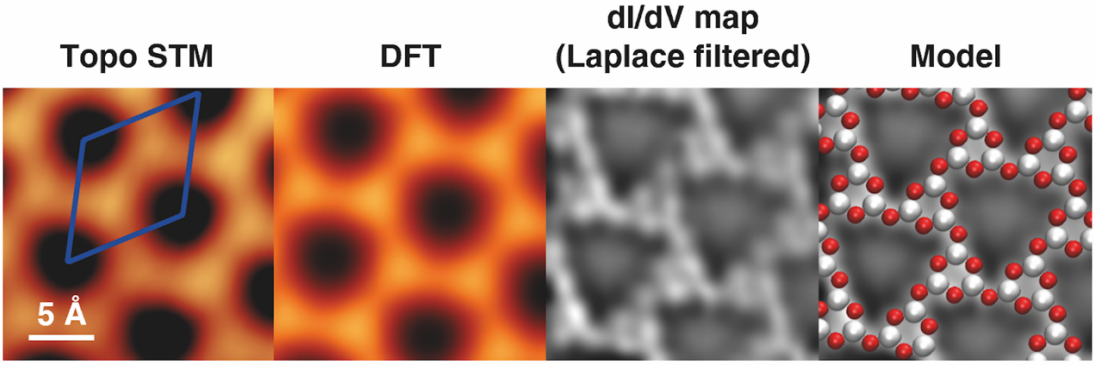

Figure 1: STM topographic image, simulated STM image, dI/dV conductance map, and relaxed atomic model superposed on the dI/dV map. The 2D unit cell of the boria layer is indicated in blue.