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Exotic behaviour of topological semimetal SB (111)

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Due to a strong spin-orbit interaction, the surface states of Sb (111) are similar to those for topological insulators. The surface states are protected by time-reversal symmetry and have linear energy-momentum dispersion relation. Surface modification (for example, defects in surface structure) leads to a local break of the surface translational symmetry and can change surface states. It is the primary reason to study the defects of Sb crystal structure and their effect on the surface states dispersion. Etching of the Sb (111) surface using Ar+ ions is a standard way to create defects both in bulk and on the surface of the crystal. For qualitative interpretation of the photoelectron features, we have provided the comparative experiments on at (111) surface and after ion etching.
Sb (111) ion etching at room temperature reveals the anomalous exotic behavior of a surface crystal structure. It results in the formation of flat terraces with a size of 2nm. Investigation of the electronic structure of the etched Sb (111) surface has demonstrated an increase of density of states at the Fermi level that was confirmed by DFT simulations. The results are discussed in terms of local break of the Peierls transition conditions.
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