Nanostructured surfaces

Micro-, nano- and electron energy structure of cleavage surfaces of Ni_xInSe hybrid intercalate systems

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The experimental study results of element-phase composition, crystallographic, topographic and electron-energy structures of interlayer cleavage (0001) surfaces, obtained for nickel intercalated ($Ni_{3d}InSe$ intercalate) InSe layered crystals are presented. The complex of methods, such as X-ray photoelectron spectroscopy (XPS), low energy electron diffraction (LEED) and scanning tunneling microscopy/spectroscopy (STM/STS), was applied. It was established that for all Ni_xInSe hybrid intercalate systems with different concentrations of nickel in initial synthesized InSe+x at.% Ni (x10,0 %) alloys and layered crystals further grown from them by Bridgman–Stockbarger method and subjected to intercalation, the maximum concentration of Ni on the cleavage (0001) surfaces and, thus, in the interlayer gaps of up to 7.67 at. % is observed at 0.75 at. % of Ni in synthesized alloys.

Nickel doesn't interact with selenium and indium and there are also no interactions with oxygen and carbon. STM study suggests lack of reconstruction for Ni_xInSe (0001) cleavages like as for pure InSe ones. Combination of micro (LEED) and nano (STM/STS) level surface analyses showed that Ni, which is placed in the interlayer gaps of Ni_xInSe intercalates, and, consequently, detected on the (0001) cleavages forms its own ordered 3,5Å x 3,5Å surface structure. The most obvious that intercalate on the surface exists in the form of fine-phase metal nickel clusters. Thus, Ni_xInSe intercalate system is the perfect hybrid structure to be applied in magnetoelectronics.