

Decomposition of InP and Growth of Indium Islands in Systems with H-atoms

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The decomposition of indium phosphide has been investigated by Auger-electron spectroscopy and mass-spectroscopy. Scanning electron microscopy has been used for study of indium islands growth on surface of the compound semiconductor. The role of atomic hydrogen in processes of decomposition and growth of metallic islands was determined by comparing with these processes under vacuum.

It has been established:

- both in vacuum and in systems with atomic hydrogen the subsurface layers of indium phosphide loses the phosphorus atoms;
- an increasing of concentration of atomic hydrogen in gas phase of system causes a decreasing of minimal temperature of the decomposition;
- during dissociation of InP in vacuum the phosphorus molecules P_2 and P_4 are main species which are forming and desorbing from semiconductor surface;
- during decomposition of InP in gas environment with high concentration of H-atoms the species P_2 , P_4 and PH_3 are forming;
- an interaction of hydrogen atoms with atoms of the semiconductor surface causes the significant decreasing of activation energy of forming and desorption of phosphorus molecules P_2 and P_4 .

The surface of indium phosphide samples after treatment in vacuum or in gas environment with high concentration of H-atoms shown on fig.1 and 2. Some mechanisms of the decomposition of InP and the growth of indium islands will be discussed.

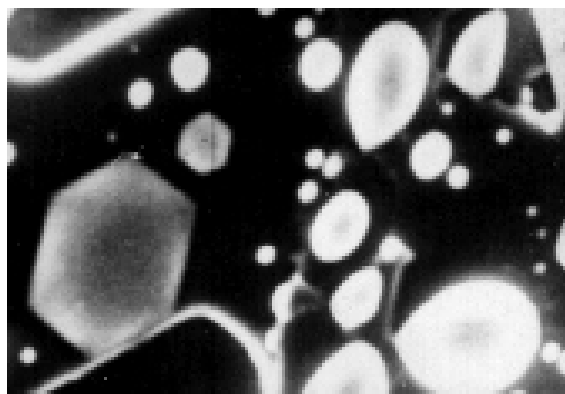


Fig. 1. Surface of InP after dissociation in vacuum. The temperature of treatment is about 800 K.

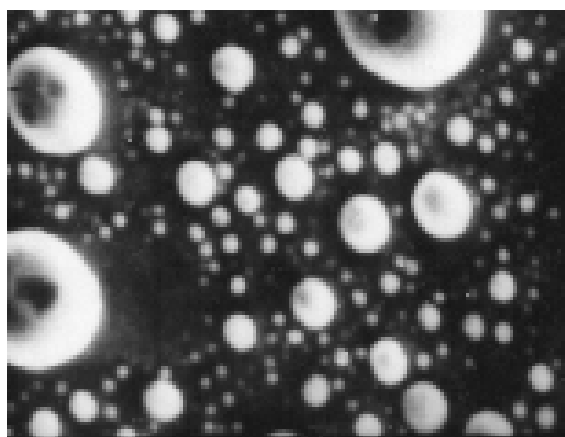


Fig. 2. Surface of InP after decomposition caused by effect of atomic hydrogen. The temperature of treatment is about 500 K.