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Theed study OF Ar – Kr equimolar alloy morphology

Solid Binary mixtures of cryocrystals are of considerable interest for many reasons [1]. One of them is the possibility of the compare the experimental results with theoretical predictions. According theoretical model of rare – gas binary alloys proposed by Prigogine [2] the solutions should separate in the pure components below about 40 K. This critical temperature depends on the concentration and is a maximum for an equimolar solution.

Key words: Gas mixtures, low temperatures, the binary system.

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Исследование Ar – Kr эквимолярной морфологии сплава

Твердые бинарные смеси криокристаллов представляют значительный интерес по многим причинам [1]. Это возможность сравнить экспериментальные результаты с теоретическими предсказаниями. По теоретической модели газовых бинарных сплавов, предложенных Пригожиным [2], должны выделяться в чистых компонентах ниже температуры 40 К. Эта критическая температура зависит от концентрации и максимума для эквимолярного решения.

Ключевые слова: газовые смеси, низкие температуры, бинарные системы.

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Ar – Kr қоспасының эквимолярлы морфологиясын зерттеу

Криокристалдардың қатты бинарлы қоспалары көптеген себептермен қызығушылық тудырады [1]. Олардың бірі, әрдайым эксперименттен алынған нәтижені теориямен салыстыра алатындығын. Теориялық үлгі бойынша бинарлы қоспалардың, Пригожинның ұсынысымен [2] таза күйінде 40 К төмен температурада ғана бейнеленуі керек. Бұл критикалық нүкте эквимолярлық шешімнің концентрациясымен максимумына тәуелді.

Түйін сөздер: газ қоспалары, төменгі температуралар, бинарлы жүйелер.

Solid Binary mixtures of cryocrystals are of considerable interest for many reasons [1]. One of them is the possibility of the compare the experimental results with theoretical predictions. According theoretical model of rare – gas binary alloys proposed by Prigogine [2] the solutions should separate in the pure components below about 40 K. This critical temperature depends on the concentration and is a maximum for an equimolar solution.

Experimental investigations of binary mixtures of the inert gases are contradictory. In electron diffraction studies [3, 4] a phase separation in the Ar – Kr systems was not observed at T=7 K. However measurements on the diffuse and Bragg scattering of neutrons [5] from Ar – Kr samples indicated the solubility of argon micro clusters in the krypton – rich phase and the solubility of krypton atoms in the argon – rich phase.

THEED (Transmition High Energy Electron Diffraction) investigations were carried out in a standard electronograph EG–100A equipped with a helium cryostat. The deposition regime was chosen in order to obtain random distributions of impurity. The samples were grown in situ by depositing gaseous mixtures on Al substrate. The error in the lattice parameter measurements was

usually 0.1%. The concentration dependence of the lattice parameter are measured at T=20 K for low concentrations.

The structure of equimolar solid Ar – Kr equimolar alloys has been investigated at the condensation temperature 5 K and 20 K and in the process of subsequent temperature change right up to sublimation of specimens, which took place at temperature range between T=32 to T=45 K . In the composition range K 40 – 60 mol% Ar, at the condensation temperature T=20 K the face centered cubic phase was observed. In this region the concentration dependence of the lattice parameter was measured. The low temperature equimolar samples were multiphase. Crystallographic structure of observed phase was determined. The obtained results indicate a limiting solubility in Ar – Kr system.

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