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### Relaxation processes in a weak solution of cryocondensed water, heavy water and ethanol with nitrogen and argon

Earlier studies of stability of ethanol molecules in nitrogen cryomatrix showed that the state of immobilized ethanol molecules in the matrix is not stable [1]. A slight increase of temperature of the matrix, long before its evaporation leads to a change in the vibrational spectra in a two-component solid solution of ethanol and nitrogen. This article considers the results of continued research in this direction.

**Key words:** cryomatrix isolation, a weak solution, temperature, evaporation

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### Релаксационные процессы в слабых растворах криоконденсатов воды, тяжелой воды и этанола в матрице азота, аргона

Более ранние исследования устойчивости молекул этанола в криоматрице азота показали, что состояние иммобилизованных молекул этанола в матрице не является стабильным [1]. Незначительное повышение температуры матрицы, задолго до ее испарения, приводит к изменению колебательных спектров в двухкомпонентном растворе этанола и азота.

**Ключевые слова:** Криоматричная изоляция, слабый раствор, температура, испарение.

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Ертеректе жасалған зерттеулер көрсеткендей, азот криоматрицасындағы этанол молекуласындағы орнықтылығы, иммобилизацияланған этанол молекулаларының азот матрицасында тұрақты емес екендігі көрсетілді [1]. Матрицадағы температураның өзгеруі этанол және азот қоскомпонентті қоспаның тербелмелі спектрлерінің өзгеруіне әкеліп соғады.

**Түйін сөздер:** криоматрицалық оқшаулау, әлсіз ерітінді, температура, булану.

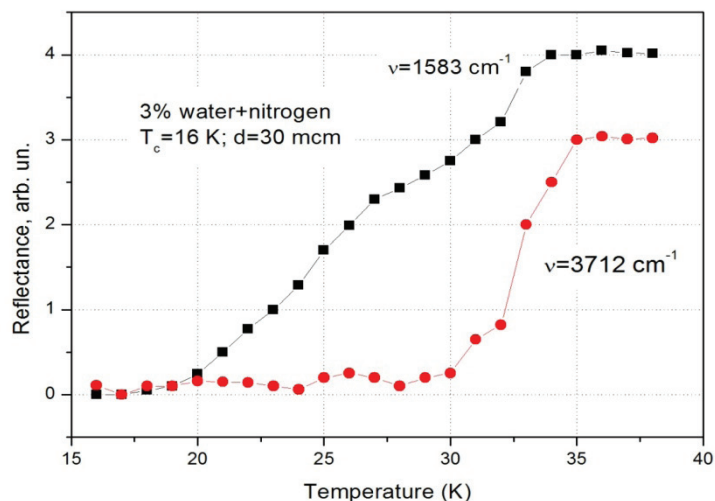
Earlier studies of stability of ethanol molecules in nitrogen cryomatrix showed that the state of immobilized ethanol molecules in the matrix is not stable [1]. A slight increase of temperature of the matrix, long before its evaporation leads to a change in the vibrational spectra in a two-component solid solution of ethanol and nitrogen. This article considers the results of continued research in this direction. Weak solutions of water, heavy water and ethanol in cryomatrix of argon and nitrogen were investigated. The measurements were carried out in the temperature range of 12-40 K and condensation

pressures of  $10^{-5}$ Torr. The concentration of the analytes in the matrices was set in the range from 0.5% to 10%. The conclusion about states of molecules was made on the basis of comparison between oscillatory ranges of two-component solid solutions and thin films of pure cryocondensates of the substances. Quantum and chemical calculations were also taken into consideration [2-4].

On the basis of experimental results it is supposed that polyaggregates of different scale are formed in the process of co-condensation of water and ethanol with matrix gases. Thus some molecules, which

are forming these units and settling down in a near-surface zone of these clusters, are not connected with the next molecules by intermolecular interaction. As a result they exist in a quasi-free state. Spectral reflection of this fact is an existence of lines of absorption in the oscillatory ranges of the samples

which correspond to monomers and linear dimer of water and ethanol. An increasing temperature of the matrix leads to transformations in polyaggregate state that is proved by change of absorption amplitudes at the frequencies of characteristic fluctuations of quasi-free molecules of water and ethanol.



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