



**Pacific  
Conference on  
Spectroscopy and  
Dynamics**

**JANUARY 30-FEBRUARY 2, 2020  
BAHIA RESORT HOTEL, SAN DIEGO, CALIFORNIA**



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# 67<sup>TH</sup> PACIFIC CONFERENCE ON SPECTROSCOPY AND DYNAMICS

BAHIA RESORT HOTEL  
SAN DIEGO, CALIFORNIA, USA

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## **Abstracts for Talks and Posters**

**On thermal stability of cryovacuum deposited CH<sub>4</sub>+H<sub>2</sub>O films**

A. Aldiyarov<sup>1</sup>, A. Drobyshev, D. Sokolov<sup>1</sup>, A. Akylbayeva<sup>1</sup>, A. Nurmukan<sup>1</sup> and N. Tokmoldin<sup>2</sup>

<sup>1</sup> *Institute of Experimental and Theoretical Physics, al-Farabi Kazakh National University, 96a, Tole-bi Street, Almaty, 050012, Kazakhstan*

<sup>2</sup> *Institute of Physics and Technology, Satbayev University, 11, Ibragimov Street, Almaty, 050032, Kazakhstan*

Stable homogenous states of aqueous hydrocarbon solutions are typically observed at high temperatures and pressures far beyond the critical values corresponding to individual components. Both homogeneity and internal stability of such mixed systems may be preserved upon transition into the region of super-cooled (metastable) states, characterized by low values of thermodynamic variables. This work focuses on the study of structure-phase equilibria of the two-component system of water and methane in the region of metastable states, which is argued to be thermodynamically analogous to structure forming conditions in a single-component system. Vapor mixtures of water and methane were vacuum deposited with various ratios under strongly metastable non-equilibrium conditions onto a cooled substrate. The obtained low-temperature thin films were studied using vibrational spectroscopy in the temperature range of 16-180 K. During thermal annealing of the samples, characteristic vibrational C-H modes of methane were monitored alongside chamber pressure to register both structural changes and desorption of the film material. Annealing of the samples resulted in changes in the monitored thermodynamic parameters which act as indicators of structure-phase transitions in the films. The obtained data reveals that upon co-deposition of methane and water, methane molecules appear both in non-bound and trapped states. Although trapping is, in general, expected to occur within pores, our data is also consistent with formation of clathrate of methane hydrate.