# Heat transfer enhancement due to the spinodal decomposition of highly superheated solutions with the lower critical dissolution temperature

**Volosnikov D V[1,@], Povolotskiy I I[1], Vasin M G[2,3] and Skripov P V[1]**

[1] Institute of Thermal Physics of the Ural Branch of the Russian Academy of Sciences, Amundsen Street 107a, Ekaterinburg 620016, Russia
[2] Institute for High Pressure Physics of the Russian Academy of Sciences, Kaluzhskoe Shosse 14, Troitsk, Moscow 142190, Russia
[3] Ural Federal University, Lenina Avenue 51, Ekaterinburg 620000, Russia

[@] dima_volosnikov@mail.ru

Aqueous solutions studies are in demand when creating miniature cooling systems for electronic devices. Traditional liquid cooling systems are based on heat transfer intensification due to the liquid-vapour phase transition. However, in case of miniature heat exchangers application, local superheating and destruction of the heat exchanger due to the "dry" spots appearance in the course of vapour formation is not excluded. This research is aimed at studying spinodal decomposition, as a type of phase transition associated with the separation of the unstable solution (superheated with respect to liquid-liquid spinodal) into two phases of different composition. The object of study is an aqueous solution of polypropylene glycol (PPG) with an average molecular weight 725 pulse heated above the lower critical dissolution temperature.The report presents the following results of the study of aqueous solution PPG-725: phase diagram with binodal lines (experiment) and spinodals (calculation); coefficients of the instantaneous heat transfer to aqueous PPG solution in the regions of stable and unstable states obtained by the pulsed isothermal effect on substance. On the solution's phase diagram the region of spinodal decay is determined; it was also found that the instantaneous heat transfer coefficient of the solution significantly exceeded the corresponding value for pure water. This study was supported by the Russian Science Foundation (project No. 19-19-00115).