Evolution of properties of thin film mixtures of hydrogen-bonded molecules at low temperatures

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The processes of deposition, sublimation and secondary deposition of gases at low temperatures are an integral part of the heat-mass transfer phenomena in cryogenic-vacuum equipment and are of high relevance for operation of optical devices in space conditions. It is well-known that the considerable amount of substance in the Universe represents multi-component ices cryogenically deposited on the surface of space objects. Under the influence of external factors, such ices may undergo phase transitions, wherein some of their components may evaporate, leading to structural transformation of the remaining material. Consequently, a new phase is formed, whose properties depend on cluster composition of the remaining material as well as the surface temperature. Such processes may be modeled using cryogenic equipment in a laboratory environment. The current work is aimed at a comprehensive study of formation, evolution and restructuring of thin film mixtures of ethanol and methanol with an inert argon host material, following evaporation of the latter. The samples are formed during cryovacuum deposition of the test substance from the gas phase to the substrate at low temperatures in the range from 10 K to 40 K and gas pressures from 10^7 Torr to 10^3 Torr. The thickness of the sample varies from 10 μm to 100 μm.