Micropore capillary condensation/evaporation of water

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Résumé

The problem of surface moisture and condensation inside microstructures is complex and depends on the physicochemical characteristics of both the atmosphere and the surfaces. The relative humidity within a pore is a function of the temperature, mixing ratio, pore geometry, and presence and nature of soluble salts and can be considerably pores types as well as on atmospheric relative humidity. However, although the phenomenon of capillary condensation is a complicated process, it would be useful to introduce a critical relative humidity and temperature in micropores structures. Capillary condensation in micropores is a irreversible process as revealed by experimental measurements. Nevertheless, micropore condensation of water occurs very slowly at relative humidity close to or equal to critical relative humidity, depending on both the properties of pore walls and the pore size and even types of the pore which is internal, external, or capillary types of pores. Capillary evaporation of water occurs at pressures expected from the Kelvin equation that describes the link between capillary condensation and micropores size and wall properties such as contact angles and surface tension of water and pore diameter. To examine the mechanisms of condensation and evaporation of water in micropore structures, we report the critical relative humidity in different geometry of capillary pores and as well as dependency of the critical relative humidity on temperature and various contact angles.

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