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RESEARCH NOTES

大气环境中静态小液滴对周围气体吸收的研究

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摘要 Absorption of gaseous species into stationary droplets is a fundamental interest of mass transfer between liquid droplets and ambient gas, which plays a key role in atmospheric environment control and many industrial applications. In this paper, two different considerations including equilibrium and non-equilibrium relations at the interface are used to analyze and predict the absorption time for a physical absorption at a relatively low solubility of gas. For the equilibrium pattern, in the beginning period of absorption, the mass transfer rate is considerably rapid and afterward becomes slower and slower and finally comes to almost zero as the droplet concentration closes to the saturated value. Differently, when the non-equilibrium model is adopted, the interfacial concentration increases gradually with the bulk concentration of liquid droplet, and the absorption rate mildly decelerates with the increase of bulk one throughout the process, which leads to a longer absorption time. Based on the diffusion equation of species, the concentration distribution within the droplet at different times is computed. A solution for CO2 absorption into a small water droplet is given.

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The Analysis of Gas Absorption into a Stationary Droplet in Atmospheric Environment

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Abstract Absorption of gaseous species into stationary droplets is a fundamental interest of mass transfer between liquid droplets and ambient gas, which plays a key role in atmospheric environment control and many industrial applications. In this paper, two different considerations including equilibrium and non-equilibrium relations at the interface are used to analyze and predict the absorption time for a physical absorption at a relatively low solubility of gas. For the equilibrium pattern, in the beginning period of absorption, the mass transfer rate is considerably rapid and afterward becomes slower and slower and finally comes to almost zero as the droplet concentration closes to the saturated value. Differently, when the non-equilibrium model is adopted, the interfacial concentration increases gradually with the bulk concentration of liquid droplet, and the absorption rate mildly decelerates with the increase of bulk one throughout the process, which leads to a longer absorption time. Based on the diffusion equation of species, the concentration distribution within the droplet at different times is computed. A solution for CO2 absorption into a small water droplet is given.

Key words absorption; droplet; mass transfer; concentration distribution

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