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Correlation for Sessile Drop Evaporation[1] PETER KELLY-ZION, CHRISTOPHER PURSELL, GREGORY WASSOM, BRENTON MANDELKORN, CHRIS NKINTHORN, Trinity Univ — To better understand how the evaporation of sessile drops and small puddles is controlled by the vapor phase transport mechanisms of mass diffusion and buoyancy-induced convection, the evaporation rates of eight liquids evaporating under a broad range of ambient conditions were correlated with physical and geometrical properties. Examination of the correlation provides valuable insight into how the roles of diffusive and convective transport change with physical and geometrical parameters. The correlation predicts measured evaporation rates to within a root-mean-square error of 7.3%. The correlation is composed of two terms, a term which provides the rate of evaporation under diffusion-only conditions, and a term which provides the influence of convection. This second term suggests the manner in which the processes of diffusion and convection are coupled. Both processes are dependent on the distribution of the vapor, through the molar concentration gradient for diffusion and through the mass density gradient for convection. The term representing the influence of convection is approximately inversely proportional to the square root of diffusivity, indicating the tendency of diffusive transport to reduce convection by making the vapor distribution more uniform.

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