An Experimental-Theoretical Study on Static Batch Sublimation with Laminar Flow and Constant Wall Temperature

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Abstract

The major features of a static batch sublimation process over a hot plate with constant temperature were investigated in an experimental-theoretical study. An experimental apparatus with a real-time display was built to sublimate dry ice blocks of different sizes, in either circular or rectangular geometries. When temperature of the hotplate was changed from -30 to 200 oC, heat transfer coefficient "hsub" decreased from 126 to 70 W/m2K, while thermal flux increased, linearly. Weight and area of the block had a positive/negative effects on heat transfer, respectively. In theoretical part, two "linear- gradient" and "cubic" models were developed by a combined mass-momentum-energy balance. The latter used Von Karman temperature profile, and in cases of circular and rectangular geometries could estimate "hsub" with 17.8 and 13.5 % average error. Linear-gradient was analytic, with similar accuracy in the circular case. The developed model are especially useful for design of sublimation equipment in purificationofthechemicals

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