

Author: [ADVANCED](#) | Volume Page
 Keyword: |



[TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

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[\[PDF \(648K\)\]](#) [\[References\]](#)

Limiting Partition Coefficient in a Tubular Ice System for Progressive Freeze-concentration

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A tubular ice system is effective for the scale-up of progressive freeze-concentration. The effective partition coefficient, K , as an index for the effectiveness of progressive freeze-concentration, is defined by the ratio of solute in ice and liquid phase. K is dependent both on the ice crystal growth rate and the mass transfer coefficient at the ice-liquid interface, as described by the concentration polarization model. The limiting partition coefficient, K_0 , corresponds to K at the infinitesimal ice crystal growth rate and/or infinite mass transfer at the interface. K_0 is an important process parameter for progressive freeze-concentration. A method is proposed for determining K_0 experimentally for a tubular ice system. K_0 increased with increase in the concentration of solute, which suggests that K_0 is not determined by the equilibrium process but by the nonequilibrium process at the ice-liquid interface.

Keywords: [progressive freeze concentration](#), [scale-up](#), [tubular ice system](#), [limiting partition coefficient](#)

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