

Abstract

An Improved Phenomenological Model for Polymer Desorption

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Desorption in polymers, has several “special” features which are unexplainable by Fick’s Law. These features include literal skinning – the formation of a thin, glassy skin at the exposed surface which hinders desorption – and trapping skinning. The trapping skinning behavior is contrary to expected behavior in that an increase in the forces driving the desorption decreases the accumulated flux. This research work attempts to extend a mathematical model of desorption initially developed by Comissiong *et al.*, so as to capture the trapping skinning effect both analytically and numerically.

The analysis is based on a pair of coupled boundary value problems defined in time dependent domains, together with a moving, approximately Fickian boundary separating the glassy and rubbery regions. Since the system is not solvable by similarity solutions, an integral method developed by Boley is used to obtain asymptotic solutions.

The trapping skinning behavior is observed numerically and analytically for small times, by considering the relation between the driving force of the desorption process and the accumulated flux of the polymer.

Keywords: desorption, trapping skinning, accumulated flux