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The Distribution of Surface Ages of the Liquid in a Packed Column

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Abstract: *The paper is concerned with mass transfer studies. The distribution of surface ages of the liquid in a packed column, Θ(t), to a number of experimentally measurable quantities (liquid-film mass-transfer coefficient, diffusivity and first-order reaction-velocity constant) is to be derived for the process of gas absorption. The resulting Laplace transforms have been inverted numerically using the technique of Linear Programming to obtain the surface-age distribution functions Θ(t). It is shown that the transformed functions are in very close agreement with the Danckwerts random surface-renewal model in which Θ(t) has the form* $_{se}^{-st}$. *The values of the parameter s, the fractional rate of renewal of the liquid surface, could be related to the average residence times of the liquid on the packing. It appears that Θ(t) is affected mainly by the liquid flow-rate and is independent of both the solution viscosity and density. Experimental measurements of the liquid-film mass-transfer coefficient have been carried out in a packed column over a wide range of reaction velocities and at a. number of different flow rates for two first-order reacting systems, the hydrolysis of 1. 1-dimethoxyethane in aqueous solutions and the absorption of carbon-dioxide by sodium carbonate-sodium bicarbonate buffet solutions catalysed by arsenite ions.*

Keywords: *Gas absorption, transformed functions, viscosity, density, liquid surface, packed column*