

# Instytut Inżynierii Chemicznej

Adres artykułu: <https://iich.gliwice.pl/pl/artykul/unified-approach-for-prediction-of-the-volumetric-mass-transfer-coefficients-in-a-homogeneous-and-heterogeneous-bubble-column-based-on-the-non-corrected-penetration-theory-case-studies>

## Unified Approach for Prediction of the Volumetric Mass Transfer Coefficients in a Homogeneous and Heterogeneous Bubble Column Based on the Non-Corrected Penetration Theory: Case Studies

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<b>Autorzy:</b>	<a href="#">Stoyan Nedeltchev</a>
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A critical review on the improvement of penetration theory is presented in this work. The volumetric liquid-phase mass transfer coefficients  $kLa$  in seven different liquids (1-butanol, 2-propanol, anilin, decalin, nitrobenzene, tetralin, and ethylene glycol) aerated with air in a small bubble column (BC) (inner diameter: 0.095 m) were measured at ambient conditions and further analyzed. It was found that the  $kLa$  values can be predicted satisfactorily on the basis of the classical Higbie's penetration model. The gas-liquid contact time was defined as the ratio of the Sauter-mean bubble diameter to bubble rise velocity. Moreover, the experimental  $kLa$  values were well predicted, not only in the homogeneous regime, but also in the transition and heterogeneous regimes. This is a new finding, since to date, it was considered that the penetration theory needs a correction factor for a successful application to any liquid, even in the homogeneous regime. The predictions of the mass transfer coefficients  $kLa$  in the above-mentioned seven liquids imply that the mean bubble diameters are always ellipsoidal or spherical, which is the key condition for the applicability (without a correction) of penetration theory. In the presented (in this work) model-based  $kLa$  predictions, the Sauter-mean bubble diameters were estimated by means of the reliable correlation of Wilkinson et al., which always predicts a gradually decreasing

bubble size at higher gas velocities.

## Metryczka

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