In-line analysis of droplets in absorption and distillation columns with respect to entrainment

J. Schulz, H.-J. Bart

Chair of Separation Science and Technology, University of Kaiserslautern, Germany

In distillation or absorption columns liquid drops may be entrained from the lower tray to the next tray above at high throughputs. This causes an adverse back mixing effect reducing the overall column efficiency. Up to now, only heuristic approaches are applied for the estimation of entrainment.

A new optical approach for entrainment detection is presented using a measuring probe *(s. Fig. 1)*, which is applicable at different axial and radial positions within the column in an industrial environment. The new developed probe enables in-line detection and on-line analysis of entrained drops between column trays respectively at the column head. Different test rigs (up to DN450) are used for data sampling. The new construction of the probe uses a purge gas stream to protect the front window of the probe from wetting, providing a non-wetted and clear view *(s. Fig. 2)*, leading to better image qualities, lower purge medium consumption and at the same time smaller probe measurement dimensions. A validation of the measurement results by phase doppler anemometry shows a good agreement. First results of the entrainment investigations show a strong dependence of entrainment on many parameters such as location (radial and axial position), column internals (trays, random and structured packings) and feed flow rate. Detailed results and capability of models from literature to cope with the available data will be discussed.

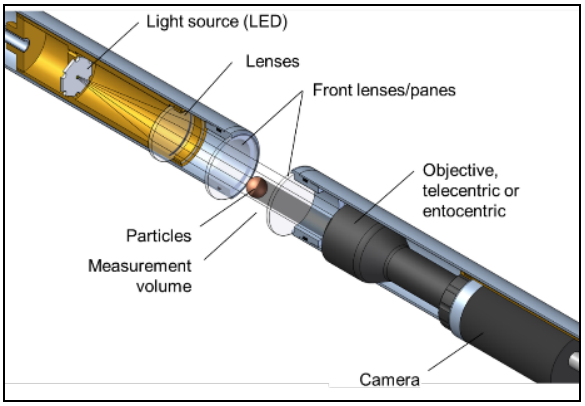

Fig. 1 *Schema of the in-line measuring probe*

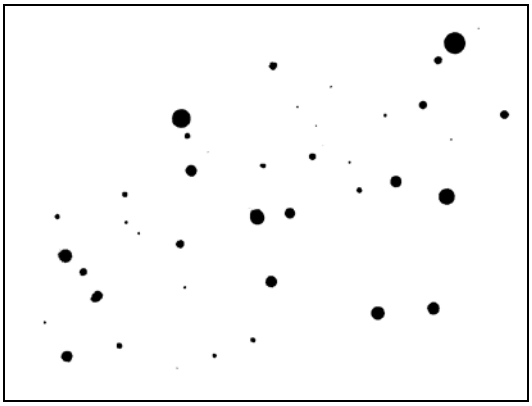

Fig.2 *Binary image of liquid drops in ambient air*

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