Application of a statistic tool for on-line characterization of bubble population complexity in a multiphase reactor

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Image analysis technique has been proved to be very effective in the quantification of particles size and morphology distributions in different work areas. In the present work this technique was combined with the Discriminant factorial analysis (DFA) in order to allow the identification of single bubbles (isolated bubbles without influence of surrounded bubbles) and to study the bubble population complexity in multiphase reactors. By this way, it is possible to determine correctly the average bubble size and, consequently, the specific interfacial area a on the different experimental conditions. With the previous methodology it has been also possible to distinguish on-line and automatically among three different classes of bubbles, allowing the computation of the bubble population complexity in the system through the new parameter, the complexity degree of bubbles. Agreement between automated and manual classification, measured in terms of a performance index, is 90% on average. Further, it describes the application of such methodology to the study of the influence of bubble characteristics (size, shape, bubble population complexity, etc) on the individual parameters of volumetric liquid side mass transfer coefficient, kLa. The experiments were done at different temperatures (25-35ºC) and superficial gas velocities (up to 14 mm/s) in a bubble column.