Research Grants for Ph.D students from the China Scholarship Council

EXPERIMENTAL STUDY OF GAS-LIQUID MASS TRANSFER IN CHANNEL AND IN POROUS MEDIA: APPLICATION TO SUSTAINABLE DEVELOPMENT ENGINEERING

生物反应器中二氧化碳和氧气的捕获：可持续发展工程中的应用

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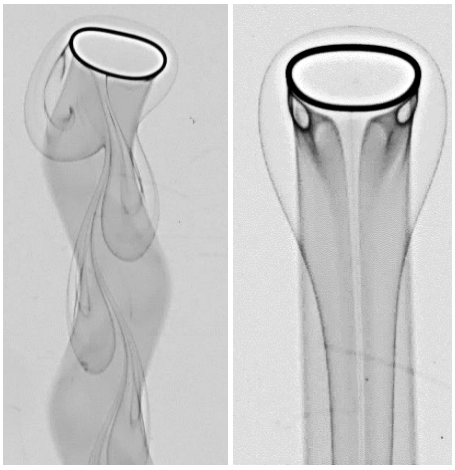
The understanding of gas-liquid mass transfer is still an active research topic as being a key operation in chemical engineering processes (effluent treatment, bio-engineering, fine chemistry, pharmaceutical industry, biofuel production).



Visualization of mass transfer around a 6mm bubble rising between two plates

The present project aims at studying gas-liquid mass transfer by an innovative colorimetric technique. This original technique will be implemented to visualize (image acquisition) and locally quantify the oxygen or carbon dioxide transfer in an aqueous solution. It will be based on the development of image post-treatment coupled with physical models to access to parameters characteristics of mass transfer. A particular attention will be paid on gas-liquid mass transfer mechanisms involved in the confined systems such as structurating plate heat-exchanger reactors, a key technology for process intensification. Indeed, when performing exothermic thermal or photochemical gas-liquid reactions in such miniaturized systems, the characterization of mass transfer between phases, strongly dependent of the gas-liquid flow patterns, plays a key role for controlling the chemical reaction performances (conversion, selectivity).
The study will focus on the impact on the gas-liquid mass transfer of the device geometry, the impact between bubble with objects and the aggregation/rupture/coalescence phenomenon.

气—

液传质作为化工过程（污水处理、生物工程、精细化工、制药工业）中的关键操作，对它的认识和理解一直以来都是一项活跃的研究课题。本项目旨在通过一种新型比色技术来研究气—
液传质。该原始技术通过图像获取的方法监测水溶液中的氧气转移过程；并在与物理模型耦合的图像后处理技术的发展的基础上，得到传质的参数特征。此外，过程强化中的一项重要技术——
由毫米管构成的平板热交换反应器（Stankiewicz和Moulijn，2000），其中的气—
液流也将受到特别关注。当在这种微型系统中进行放热气—
液反应时，相间的传质特征起到了控制化学反应的关键作用，并强烈依赖于气—
液两相流模式。此项技术也将用于其他专门用于污水处理的系统。