SPECIAL FEATURE SECTION: PHASE-TRANSFER CATALYSIS

Editorial

Introduction and Editorial to the Phase-Transfer Catalysis Special Feature Section

Phase-transfer catalysis or PTC is very near to our hearts as it was born in our industry. It was invented by process chemists, so it may truly be said this is one of our children. There are few synthetic chemists that have not marveled at the versatility of PTC, such as its ability to replace hazardous and strong bases with sodium hydroxide, reduce the reaction temperature of nucleophilic substitutions, and further enable an almost limitless universe of chemistry.

The extraction mechanism, which is the theoretical and practical basis for PTC, was first conceived in the 1950s by Henry Hennis, a process chemist at Dow Chemical. Hank was the first to outline the extraction mechanism to explain a successful alkylation reaction he developed that was catalyzed by a quaternary ammonium salt. Ten years later, Charles Starks, then at Continental Oil, reinvented the extraction mechanism and provided compelling support with detailed kinetic studies. Charles coined the term "phase-transfer catalysis", and his classic paper was published in the *Journal of the American Chemical Society* only after convincing reviewers that the behavior was not simply related to miceller effects.

Since those formative years, PTC has grown in many directions with hundreds of commercial applications for a wide variety of specialty and commodity organic chemicals and polymers. For instance this review covers the synthesis of chiral amino acids, epoxidations, asymmetric reactions such as the Strecker, aldol, Michael and others, dehalogenation for purposes of remediation, the synthesis of a drug candidate and many other reactions. Each year sees more reactions that can be improved by PTC. And yet despite this growth, the field seems to have become limited. Why do we read about new PTC reactions that seemingly possess much promise but still do not become general applications over time? While PTC can increase yields, ameliorate difficult reaction conditions, and eliminate the need for expensive reagents, it is not something you can simply take off the shelf and get to work immediately, as with most other reactions we chemists like to use. PTC requires a little thought regarding the choice of catalyst, solvent, hydration, agitation efficiency, etc. It is for this objective that this special issue was conceived: to increase the familiarity of PTC within our chemical community and, we hope, facilitate its use.

We thank all the authors in this special issue, many of whom had plenty of other work to complete yet found time to respond to our request to participate. We are grateful for your generosity in time and energy.

As with any of our children, we wonder how PTC will look and act in its maturity. Perhaps the next special issue on PTC may give us an idea. If you find the means to improve your processes by what you read here, let us know. Please enjoy this special issue and take away something to use in your laboratory or plant.

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