Sustainable Manufacturing in Multiphase Continuous Reactors: Aerobic Oxidations (SMMCR)

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Research Areas

Basic Research

At a Glance

- Status: **Active Consortium**
- Year Launched: **2013**
- Initiating Organization: **University College - London**
- Initiator Type: **Academia**
- Location: **Europe**

Abstract

The Sustainable Manufacturing in Multiphase Continuous Reactors: Aerobic Oxidations (SMMCR) project aims to instigate a step change in efficiency in the manufacture of many products by developing safe, continuous, oxidative transformations.

Mission

Although bulk chemicals are generally manufactured in efficient continuous processes, generating relatively little waste (E-factor less than 1-5), high-value chemical products (e.g., fine chemicals, agrochemicals, pharmaceuticals) are usually manufactured in batch units, generating enormous waste (E-factor approximately 25-100). Thus, there is a clear business advantage, if continuous manufacturing techniques could be adapted for use in these industries. Continuous processing can facilitate safe manipulation of potentially hazardous reagents that can nevertheless effect low-waste transformations, for example, by efficient heat-transfer in very exothermic processes and minimizing of local inventory of hazardous material. While most oxidations of bulk chemicals can be performed continuously using molecular oxygen in the gas phase, safety considerations (e.g., exotherm,

formation of explosive mixtures) preclude its use in batch processes, particularly for thermally sensitive, involatile substrates found in fine chemical manufacture. This leads to two undesirable behaviors: (a) adoption of costly, atom-inefficient, waste-generating stoichiometric oxidants, with consequent negative environmental impact and (b) a tendency to avoid oxidative transformations by using inevitably less efficient workarounds. It is therefore clear that oxidation is a potentially key enabling technology. The demonstration of cost-effective, safe, and efficient use of aerobic oxidation in an organic solvent would be transformative because a wide and increasing range of catalytic organic transformations would be considered seriously by industry, and not avoided because of safety concerns. The potential to drive further efficiency by “telescoping” subsequent transformations would also be facilitated by continuous, work-up free oxidation. Thus, this project aims to instigate a step change in efficiency in the manufacture of many products by developing safe, continuous, oxidative transformations.

Consortium History

July 1, 2013: Project started
Dec. 31, 2015: Project ended

Sponsors & Partners

IDEAS Factory Sandpits scheme

Other website http://gow.epsrc.ac.uk/NGBOViewGrant.aspx?GrantRef=EP/L003279/1

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