

Project Title:	Development of Sustainable Solid-supported Strong Acid Catalysts
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Industrial Partner:	PhosphonicS Ltd

Project Summary

There are significant drivers, particularly for manufacture of commodity chemicals, to employ cleaner processes by moving away from using large quantities of strong liquid acids. The aim of this project is to work with a leading supplier of functionalized silica materials, to develop new high performance solid-supported acid catalysts suitable for application in sustainable continuous chemical manufacturing processes. Such materials will have a number of benefits over liquid acids including: waste reduction, recyclability of the acid catalyst, simplification of the product isolation; and reduction of the unit operations required (by 75% in some cases).

There are a number of silica-based acid catalysts available on the market. The acids have short term stability and can easily be used in a batch processes, but for continuous processes the functionality is not stable enough. Polymer based acids have better stability but poor wettability. There is a need, therefore, for a more stable silica based acid catalysts.

We propose to develop flow processes for the efficient synthesis of a range of dipodal silanes,¹ that can be used to coat silicas, yielding stable materials.² Once the stability of the product is established, acid functionality will be introduced, either via the starting dipodal silane, or via post synthetic modification, and the product tested as an industrially relevant strong acid catalyst.

We are seeking a talented PhD student to work on this challenging project that will span materials chemistry, synthesis and catalytic science. The successful candidate will work both at the University of Bath and at PhosphonicS site in Compton as appropriate and will thus have the opportunity to a develop a range of synthetic, characterization and catalysis skills, as well as industrial experience in process chemistry and networks.

¹ B. A. Janeiro, B. C. Arkles, *United States patent US2007/0060765*, 15 March 2007

² B. Arkles, Y. Pan, G. L. Larson, M. Singh, *Chem. Eur. J.*, 2014, **20**, 9442 – 9450