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PII: S2468-0257(16)30109-1

DOI: [10.1016/j.gee.2017.01.003](https://doi.org/10.1016/j.gee.2017.01.003)

Reference: GEE 48

To appear in: *Green Energy and Environment*

Received Date: 30 November 2016

Revised Date: 9 January 2017

Accepted Date: 9 January 2017

Please cite this article as: P. Wang, X. Chen, D.-L. Wang, Y.-Q. Li, Y. Liu, Efficient and recyclable Rh-catalytic system with involvement of phosphine-functionalized phosphonium-based ionic liquids for tandem hydroformylation-acetalization, *Green Energy & Environment* (2017), doi: 10.1016/j.gee.2017.01.003.

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**Efficient and recyclable Rh-catalytic system with involvement of phosphine-functionalized phosphonium-based ionic liquids for tandem hydroformylation-acetalization**

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**KEYWORDS:** Phosphines; Phosphonium-based ionic liquids; Bi-functional ligands; Recyclability of homogeneous catalysts; Tandem hydroformylation-acetalization

**ABSTRACT**

The phosphine-functionalized phosphonium-based ionic liquids (**dppm-Q**, **dppe-Q**, **dppp-Q** and **dppb-Q**) as the bi-functional ligands enable the efficient one-pot tandem hydroformylation-acetalization. It was found that, in **dppm-Q**, **dppe-Q**, **dppp-Q** and **dppb-Q**, the incorporated phosphino-fragments were responsible for Rh-catalyzed hydroformylation and the phosphoniums were in charge of the subsequent acetalization as the Lewis acid catalysts. Moreover, the diphosphonium-based ionic liquid of **dppb-DQ** could be applied as a co-solvent to immobilize the Rh/**dppb-Q** catalytic system with the advantages of the improved catalytic performance, the available catalyst recyclability, and the wide generality for the substrates.

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