MS083.O05

Hybrid polyoxometalates as multifunctional materials, photoresists, green catalyst and antioxidants

Pradeep Chullikkattil Parameswaran[1], Ashwani Kumar[1], P. Guru Prasad Reddy[1]
[1]*School Of Basic Sciences, Indian Institute Of Technology Mandi, Mandi, India*
E-mail: pradeep@iitmandi.ac.in

Polyoxometalates based organic-inorganic hybrids have attracted attention for a wide variety of applications. However, the design and development of hybrid polyoxometalates for specific applications is still a challenging task for synthetic chemists. The talk will focus on our attempts to develop new Class I and Class II type hybrid polyoxometalates for their applications in some less explored areas. The first part of the talk will be on the development of a new class of multifunctional aromatic sulfonium polyoxometalate hybrids. A series of aromatic sulfonium counter ions, triflate salts of which act as ionic liquids, have been developed based on a fundamental aromatic sulfonium counter ion motif that allows structural and electronic fine-tuning by introducing substituents at multiple locations. Using these counter ions, hybrid POMs of formulae (AS)4[Mo8O26], (AS)3[PMo12O40] and (AS)4[SiMo12O40], where AS = various aromatic sulfonium counter ions, have been developed and we showed that the photochromic properties of these POM hybrids can be fine-tuned by systematically varying the substitutions on the counter ion motif. These hybrids also exhibited catalytic properties, in some cases as self-separating catalysts, towards various organic transformations. Second part of the talk will be on the development of new class II type hybrids based on [P12V3W15O62]9–, Mn-Anderson and [H3V10O28]3– type clusters and their applications i) as photoresist materials for patterning sub-25 nm features under extreme ultraviolet lithography (EUVL) conditions ii) as synthetic antioxidants and iii) as light sensitive polymeric materials for fabricating photoresponsive devices. Finally, the development of a POM based hybrid supramolecular framework material as green catalyst for the selective oxidation of sulfides in water with hydrogen peroxide as reagent will be discussed.

[1] Kumar, A. et al. (2015). Chem. Eur. J. 21, 18557 –18562.
[2] P. G. Reddy, P.G. et al. (2016). CrystEngComm. 18, 4272–4276.
[3] Kalyani, V. et al. (2015). Chem. Eur. J. 21, 2250 – 2258.

Keywords: Photochromism, Antioxidants, self-separating catalysis