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)$_4$[Mo$_8$O$_{26}$], (AS)$_3$[PMo$_{12}$O$_{40}$] and (AS)$_4$[SiMo$_{12}$O$_{40}$], 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 [P$_{12}$V$_3$W$_{15}$O$_{62}$]$_{9}^{−}$, Mn-Anderson and [H$_3$V$_{10}$O$_{28}$]$_{3}^{−}$ 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.


**Keywords:** Photochromism, Antioxidants, self-separating catalysis