Degradation of Polymers by Polyoxometalate Photocatalysts

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Plastic waste problem has grown into one of the top environmental problems of the world, and the degradable polymers are gaining attention as a means for tackling this problem. Although various strategies for degradation of polymers have been developed, they often require large loading of transition metal catalysts, suffered from slow degradation rate, and are limited to specific polymers, such as polyolefins.[1] On the other hand, the catalytic degradation of more environmentally friendly polymers, such as polyesters and polyethers, are less studied. Polyoxometalates (POMs) are structurally well-defined nanometer-sized metal oxide clusters. Compared with the common photocatalysts such as organometallic complexes or organic dyes, they possess several advantages, for example, the strong light absorption, the high thermal and redox stability, the ability to activate molecular oxygen, the structure diversity, and the tunability of their properties through changing structures, constituent elements and counter cations.[2]

In this work, we report the degradation of polymers by using polyoxometalates as photocatalysts. GPC analysis was used for the investigation of the change of molecular weights of the polymers during the reactions. In the presence of a small amount of polyoxometalate catalysts, this system can efficiently promote the photodegradation of various polyesters and polyethers. The details of the system will be discussed in the presentation.

Figure 1. Schematics of the photodegradation of polyesters and polyethers by polyoxometalates photocatalysis.

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