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VISIBLE LIGHT PHOTOINITIATORS OF POLYMERIZATION: TOWARDS HIGH EFFICIENCY, LOW COST AND NON-TOXIC INITIATORS

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Considering the serious environmental pollution and energy crisis resulted from human activities, light-activated chemical reactions are of critical importance for the sustainable development of mankind. In this regard, photocatalysis has attracted great interest and researchers from academia, industry, and government research laboratories have made remarkable progress in this field, including solar fuels (CO2 capture, water splitting, etc.), pollutants degradation, and chemical synthesis. Recently, the concept of visible-light photoredox catalysis has been successfully adopted in polymer synthesis upon soft conditions. Organometallic compounds with excellent photochemical properties (e.g. strong visible light absorption, long excited state lifetimes) have a great potential as photoinitiators for free-radical initiated [(meth)acrylates)] and cation initiated (epoxides or vinyl ethers) polymerizations. Over the years, a series of ruthenium-, iridium- or zinc- complexes have been successfully developed and applied as photoinitiators. However, the search for photocatalysts based on low-cost and non-toxic metals and allowing efficient polymerization reactions at low concentrations in the photocurable formulation remains today highly interesting and challenging. Parallel to this, a new family of photoinitiators has emerged in 2018, i.e. the TADF photoinitiators that are specially designed to exhibit long-living excited states and that can clearly compete with the traditional metal-based photoinitiators. In this presentation, recent advances in the design of metal-based and metal-free photoinitiators will be presented. The recent results obtained with these new families of photoinitiators pave the way towards the development of a new generation of highly efficient, low cost and non-toxic photoinitiators operating under visible light and soft irradiation conditions, what is cruelly missing in industries at present.

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