Photopolymerization under visible light: TADF compounds as new photoinitiators

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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 (CO_2 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.[1-2] 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-, zinc-, or copper-based complexes have been successfully developed and applied as photoinitiators.[1,2] However, the search of photocatalysts based on low-cost and none-toxic metals and allowing efficient polymerization reactions at low concentrations in the photocurable formulation remains today highly interesting and challenging.

Since 2012 and the impressive works of Chihaya Adachi on Thermally Activated Delayed Fluorescence (TADF) materials, this new family of luminescent materials has been the focus of numerous research.[3] Herein, we present unprecedented works of TADF metal complexes and purely organic compounds used as photoinitiators of polymerization. These results pave the way towards the development of third generation visible-light photoinitiators operating under soft irradiation conditions.

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References:

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