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Magnetic core@shell solid containing different metalloporphyrin as catalyst for hydrogen gas generation from photo-assisted water splitting

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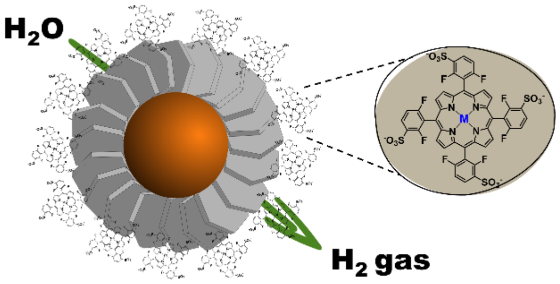
Catalysis plays a key-role in global warming concerns mitigation, helping minimizing greenhouse gas emissions by making different procedures more efficient, therefore favoring the decrease on waste generation and energy demanding [1]. A well-known catalyst class is the metalloporphyrin (MP), which is investigated in reactions that require distinct mechanisms, such as oxidation, C-C coupling and, photo-assisted systems [2]. Exploring the latter application, MP can be investigated based on the sensitized capability due to its structural properties [3], favoring the electron transfer to semiconductor solids, as layered double hydroxides (LDH), for example. Based on it, a core@shell solid of magnetite covered by two different LDH ($Mg_3Al\text{-}CO_3$ and $Ni_3Al\text{-}CO_3$) were used as support for four single MP immobilization (FeP, MnP, ZnP and MgP) (Figure). These solids were characterized by TEM, SEM, TGA, powder XRD, FTIR, and UVVIS, and investigated in water splitting reactions for hydrogen gas generation under solar simulated irradiation using triethanolamine as sacrificial agent. Furthermore, electrochemical analyses were carried out for the MP to evaluate the electron transfer mechanism in the system core@shell@MP to reduce H_2O to H_2 gas. The promising results were up to 60 µmol·g^{-1} during 6 hours of photoinduced reaction. Most of the core@shell solids immobilized by MP showed greater catalytic performance when compared to the pure supports (non-immobilized).



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