Production photocatalytique de l'hydrogène à partir de l'acide formique sous lumière visible : Photocatalyseurs à base d'oxyde de Cuivre et de Fer

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Abstract
Technological development aimed at building society expending hydrogen as an energy source, with low environmental impact and high efficiency, is urgently needed. However, as hydrogen is flammable, safety issues linked to its storage and transport limit its use as a fuel. The use of liquid organic hydrogen carriers (LOHCs) presents a very promising alternative. They enable an efficient storage and transport of hydrogen at low energy and volumetric densities. In this respect, formic acid is recognized as one of the most promising LOHC. In this thesis, we focused on the photocatalytic production of hydrogen from formic acid, using copper-iron oxide photocatalysts. These photocatalysts showed very good activity and selectivity for the dehydrogenation of formic acid under visible light at room temperature and under continuous flow. The results obtained in this thesis not only provide insight into the factors affecting the reaction, but also offer prospects for improving both photocatalyst activity and dehydrogenation selectivity. As a result, copper-based catalysts, known for their relatively low stability in liquid-phase processes, may well be considered highly promising photocatalysts specifically in the gas/vapor phase. The fundamental insights resulting from this work should have a significant impact on the sustainable and cost-effective development of highly selective hydrogen production from formic acid under mild conditions