Formic Acid: A Promising Hydrogen Storage Material

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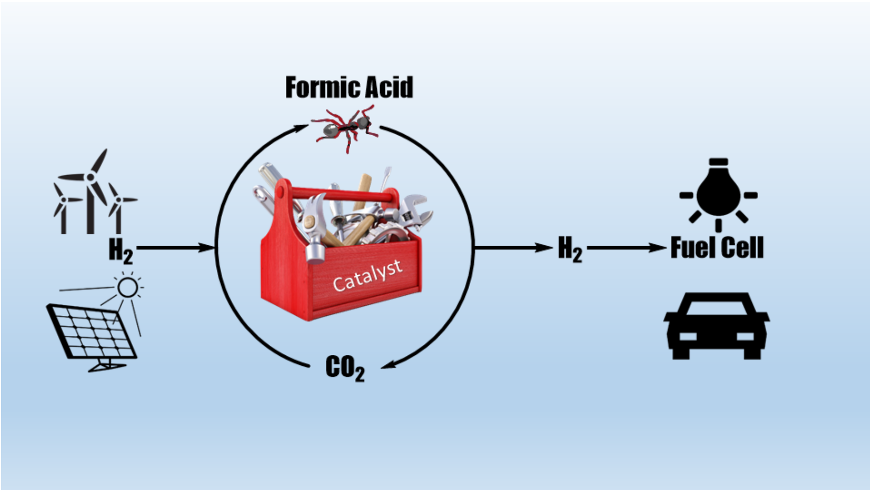
Hydrogen is, among others, widely known as a renewable and clean energy source, more precisely an energy vector. However, it is less known that the storage of hydrogen is not so evident. Indeed, the current methods to store hydrogen habitually involve high pressure (stainless steel) cylinder, having weight and safety issues, [1] not easy to handle, having obvious hazards. In order to imagine a general use of hydrogen as an energy carrier, other storage methods should be developed.[2] The principle idea would be to use renewable energy sources such as solar or wind to produce hydrogen, store it chemically bounded in small organic molecules such as formic acid, deliver it on demand and then start the cycle again, thus being CO_2 neutral if one can reuse the CO_2 released in the process.



To store and to deliver hydrogen chemically, one needs catalysts. Our group developed in 2006 a ruthenium based catalyst for the dehydrogenation of formic acid and later came up with the reduction of CO_2 to formic acid in acidic aqueous media.[3-4] In our recent work we presented a catalyst based on a non-noble metal, iron, for the dehydrogenation of formic acid in aqueous solutions.[5] In the perspective of a wide usage of formic acid as a hydrogen storage material, it would be of high interest to use a non-scarce metal, leading in lower cost of production and no risk of shortage in supply. We are now investigating the reduction of CO_2 in formic acid using similar catalysts.

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