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Formic acid dehydrogenation catalyzed using ruthenium(II) complexes bearing carboxamide ligands: Structural diversity, and mechanistic insights
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One of the most important societal concerns in light of the growing global population is the search for sustainable energy sources to meet our energy needs.1–2 Fossil fuels like oil, gas and coal are depleting. The direct use of sunlight, wind energy, water power and non-food related biomass is most attractive. The light and wind are not constantly available, and need to be converted into better storable energy vectors.3–4 Most popular hydrogen storage materials are organic compounds, so-called liquid hydrogen carriers (LOHCs). Formic acid (FA) is one of the organic compounds and has recently attracted significant attention as a chemical hydrogen storage medium in which hydrogen is established as a new energy carrier that can be used as a clean energy source because of its favourable properties. Formic acid contains 4.4 wt% of hydrogen, and it is liquid under ambient conditions, allowing it to be handled, stored, and transported easily and safely.5 In this work, ruthenium(II) complexes have been synthesised and characterized using nuclear magnetic resonance spectroscopy 1H NMR, and 13C{1H} NMR infrared spectroscopy, high resolution electrospray ionisation mass spectrometry as well as elemental analysis. These complexes were evaluated as catalyst precursors in the dehydrogenation of formic acid. All the complexes were found to be effective catalyst for the formic acid dehydrogenation under mild conditions.

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