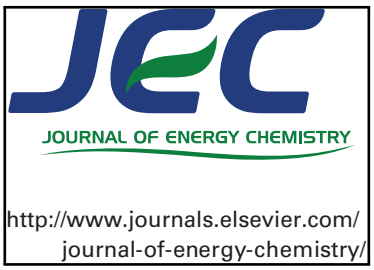

Highly-efficient and autocatalytic reduction of $NaHCO_3$ into formate by in-situ hydrogen from water splitting with metal/metal oxide redox cycle

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Highlights

- Zn, Al, Mn, Fe exhibit excellent ability of dissociation of water with $NaHCO_3$ under hydrothermal conditions.
- The *in situ* produced hydrogen possesses high activity for hydrogenation of $NaHCO_3/CO_2$ into formate/formic acid.
- The metal oxidized products, such as ZnO, MnO, Fe_3O_{4-x}, act as autocatalysts for $NaHCO_3/CO_2$ reduction.
- A highly-efficient approach for reduction of $NaHCO_3$ into formate was achieved by coupling with a metal/metal oxide redox cycle.