

INORGANIC SEMINAR

Catalysis for the Repurposing of Poly(Vinyl Chloride)

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Poly(vinyl chloride) (PVC) is the third-most mass produced polymer, with applications ranging from long-term construction to disposable medical application. However, this polymer has the most harmful end-of-life to the environment. Regardless of if PVC items end up in a landfill or recycling stream, thermal and photochemical degradation cause harmful production of hydrochloric acid, dioxins and leaching of toxic additives. While many polymers can be pyrolyzed to smaller hydrocarbon reagents, the HCl release, which is 58 wt% of PVC, complicates the process. This problem requires removal of chlorine from PVC without the production of corrosive byproducts, while leaving behind an organic product and Cl-containing product that have use and value. Discussed herein are some of the first catalytic routes to full and controlled partial dechlorination of PVC to yield selective polymer products and benign chlorinated products under mild conditions. Two strategies have been realized to promote dechlorination of PVC. Metal catalysis with a rhodium complex and sodium formate can show full dechlorination with minimal branching in the polyethylene-like product. Alternatively, silylium catalysis can show full dechlorination in less than an hour to form polyethylene-like products, with tunable degrees of branching. When the reaction is performed in an arene solvent, combined hydrodechlorination and Friedel Crafts Alkylation can be used to produce polyethylene-co-polystyrene copolymers.



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