Mechanochemical Conversion of the Persistent Organic Pollutant Trichloropropane to a Platform Chemical Utilizing the Grignard Reaction

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Currently, the invention of cost-efficient technologies for the remediation of persistent organic pollutants (POPs) is of growing interest and importance. As a proof of concept, we have developed a high-yielding method for the synthesis of useful homoallylic alcohols from 1,2,3-trichloropropane (TCP), a chlorinated POP with high chemical resistance, which is present in groundwater. Here, we demonstrate a one-step protocol for the mechanochemical conversion of pollutant (TCP) by milling a TCP, metal (Mg, In or Zn), and a 2-naphthaldehyde in a ball mill at 30 Hz for 1 hr. The method features operationally safe and simple, reduced solvent usage, short reaction time, and no inert atmosphere required. This work not only presents a greener approach to Grignard chemistry but also showcases the power of mechanochemistry in transforming environmental burdens into valuable resources.

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