Mechanochemistry an Eco-efficient strategy for chemical production

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The environmental impact of chemical industries, and particularly pharmaceutical industries, is an important problem. In 2015, 52 Mtons of CO_2 were release in the atmosphere which is more than the automotive industry. Although there have been efforts to reduce the environmental impact of chemical production, the use of organic solvents, responsible for 75% of energy used, is still a critical step in many processes. Clearly, new methods to produce chemicals in a green, efficient, and economically friendly way are required. We aim to address this issue by using mechanochemistry: a solvent-free, highly efficient, environmentally friendly, and affordable disruptive technology to produce chemicals. By showing that mechanochemistry is a green, efficient, and affordable alternative to current small molecule manufacturing methods, we will contribute to reduce environmental pollution. In a similar context, in 2022, Sparati *et al.*, in *ACS Sustainable Chem. Eng.,* showed that switching a process from the standard homogenous batch to mechanochemistry can reduce ecotoxicity and CO_2 emissions by more than 85%, while also reducing the production costs by 12%. The time to strengthen and validate the use of mechanochemistry for small molecule manufacturing development is now. However, this strategy still suffers from several important limitations precluding its use for large-scale industrial applications. The development of efficient mechanochemistry methods using readily accessible reagents and "scale-compatible" reaction conditions remains for the moment an unsolved challenge, requiring specific attention because it creates many engineering challenges. Based on this assumption, I will show you my last discovery on the application of mechanochemistry for the preparation of small molecules dedicated to the pharmaceutical and agrochemical market by eco-sustainable way. Furthermore, mechanochemistry at different scales have been used to display key parameters related to scale-up of bead-mill mechanochemistry.