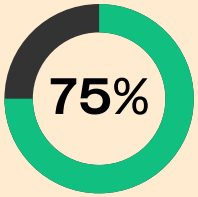
Mashing molecules: an innovative solution towards greener pharmaceuticals

Mechanochemistry: reactions without solvents

Liquids in flasks and vessels

Solids in mortars & ball mills

Mechanochemistry uses mechanical force to drive chemical reactions. With techniques like grinding and milling, mechanochemistry gets rid of solvents, reducing the overall environmental impact, especially by minimising the amount of waste and unnecessary by-products.



Solvents' energy consumption

Previously overlooked by most chemical industries, mechanochemistry now experiences a resurgence thanks to its greener approach to synthesis.

The need for solvents is associated with 75% of the energy consumption in pharma – removing them will streamline processes and maximise atom economy and efficiency, both principles of green chemistry.

Working with the pharmaceutical industry

We count on key partners in the pharmaceutical industry to ensure efficient technology transfer and an early adoption of the mechanochemical solutions.

MERCK NOVARTIS

Three API families

Antidiabetics Anticancer Antihypertensives

Using mechanochemistry, we will target different APIs in three families of compounds – all key products and intermediates in pharmaceuticals.

Mashing molecules towards greener chemistry and reduced pollution

1 kg +180 kg

Currently, the manufacture of 1 kilogram of active pharmaceutical ingredients (APIs) is unavoidably linked with almost 200 kilograms of waste. The elimination of solvents from synthesis and purification could minimise the ecological impact of industrial chemistry.

Recent data published by our consortium members shows that switching to mechanochemistry for the production of APIs, including WHO essential medicines, reduces ecotoxicity and carbon emissions but increases efficiency.

-85% ecotoxicity and CO_2

-12% production costs

Our main methods to mash molecules:

Ball mills Twin-screw extrusion Resonant acoustic mixing

Discover the 12 principles of Green Chemistry

A guide for greener chemicals, processes, and products.

tiny.cc/12Principles

Our project in numbers

€7.7 million

17 partners

11 countries

4 years

The goals of IMPACTIVE

0.5 kg TRL 5

We will scale up mechanochemical processes of API manufacturing, to reach productions up to 0.5 kg and a TRL of 5. Collaborations with industry will ensure exploitation and early implementation of the innovative methods.

Impactive has received funding from Horizon Europe. In four years, we will create a cross-collaboration between academia and industry to boost the possibilities of greener manufacturing methods with mechanochemistry.

Impactive

Co-funded by the European Union

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