

CHIMIA REPORT/COMPANY NEWS

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Companies present themselves and their products

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Flow chemistry through mechanochemical synthesis

WAB-GROUP® is the global expert in wet grinding technology, mixing technology and flow chemistry with its agitator bead mills (DYNO®-MILL), three-dimensional shaker mixers (TURBULA®, dyna-MIX®) and mechanochemical reactors (WAB IMPACT REACTOR®). For more than 60 years, WAB-GROUP® is setting the standard for quality and innovation and supports and advises its international customer base from various industries such as battery materials, chemicals, pharma, cosmetics, and food technology.

In the chemical and pharmaceutical industry, a shift towards the promotion of green chemistry can be observed. This opens up new opportunities to challenge traditional batch production methods - with the aim of reducing both energy consumption and the amount of solvent used, while increasing process efficiency in terms of yield and API selectivity.

Flow chemistry and mechanochemistry

Flow chemistry and mechanochemistry offer a promising alternative to batch production. In flow chemistry, chemical processes are taking place in a continuously flowing stream contrary to batch production. This offers several compelling advantages such as better mass and heat transfer, faster reactions and increased quality in terms of conversion, yield and selectivity alongside smaller holdup reactive volume, which makes it inherently safer. The combination of these benefits tends to make processes more reliable and easier to scale-up. Mechanochemical reactions are understood to be “chemical transformations initiated or sustained by mechanical force”.¹ Advantages of mechanochemistry are next to energy and cost savings, the possibility of solvent-free reactions and excellent surface renewal of the reactants.

WAB mechanochemical reactors

To meet the changing requirements of the industry, WAB-GROUP® has developed innovative and sustainable reaction platforms with a high throughput rate. WAB's mechanochemical reactors have proven their positive impact on reducing solvents, energy consumption and toxic waste. Furthermore, they improve the conversion, yield and selectivity of chemical reactions and optimise reaction costs in various application fields.

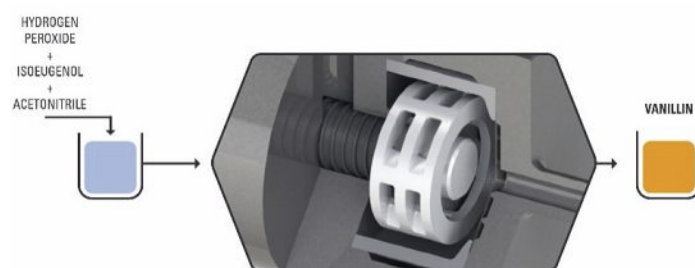
Paracetamol synthesis^{2*}

Paracetamol is a drug used to relieve pain and reduce fever. In comparison to current solvent-based productions, the process on a WAB mechanochemical reactor achieved higher yield while also allowing the complete removal of solvents to realise the desired chemical reaction. Additionally, the synthesis is much faster than with conventional methods.

Vanillin synthesis^{2**/***}

Vanillin is the major component of natural vanilla and an important flavouring agent widely used in the food, beverage, perfume and

pharmaceutical industry. Performing the synthesis of vanillin on WAB mechanochemical reactors showed a shorter process time, lower process temperature and higher process productivity. The reaction was achieved without using any catalyst and a scale-up from lab to pilot scale was successfully carried out.

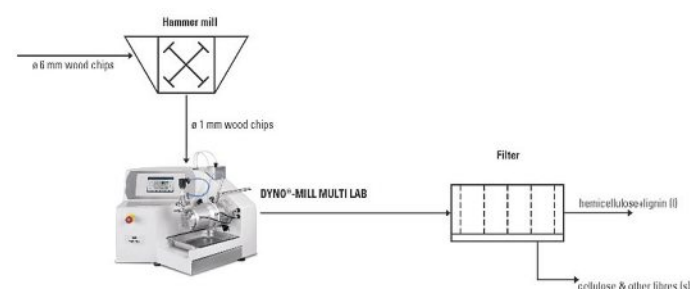


Calcium zincate synthesis^{2****/*****}

Calcium zincate (CAZN) can be used in the production of zinc anode of alkaline electrochemical generators, heterogeneous catalysts to produce biodiesel or for antifungal products. Most often this product is used for electrodes in zinc batteries. Laboratory tests indicated that using a mechanochemical process, the CAZN has more reaction surface and a 1.77 times faster activation of the battery.

Wood chips components separation^{2***/*****}

Processing and depolymerization of wood waste with a WAB mechanochemical reactor enables faster and more environmentally friendly extraction of cellulose, hemicellulose and lignin. Compared to conventional hydrothermal process, less energy and less production time is needed.



Synthesis of zinc glycerolate^{2**}

Zinc glycerolate is used as an additive for the vulcanisation of rubber and in the plastics industry. WAB mechanochemical reactors enable a high reaction temperature and are therefore predestined for the production of zinc glycerolate.

Contact us to test and develop your chemical reaction in our fully equipped Process Technology Centre in Muttens (CH).



Contact

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¹ Do, Jean-Louis & Friščić, Tomislav. Mechanochemistry: A Force of Synthesis. ACS Central Science 2017, 3, 1, 13–19.

² The research was led by *HEIA-FR and Université de Montpellier, **Deasyl SA, ***University of Cordoba, ****EasyZinc, *****UNESCO Chair in Life Cycle and Climate Change. Find more information at <https://www.wab-group.com/en/solutions/application-cases/>