MS36-O2 The Emergence of Medicinal Mechanochemistry

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This presentation will highlight how the overlap of previously unrelated areas of solid-state mechanochemical synthesis,[1] *i.e.* screening for API solid forms, organic synthesis by milling, and mechanochemical screening for molecular recognition, enables the emergence of a new research discipline in which different aspects of pharmaceutical and medicinal chemistry are addressed through solid-state reactivity, rather than the conventional solution-based routes.This nascent area of *medicinal mechanochemistry* [2]is likely to have a strong impact on future pharmaceutical and medicinal chemistry, by offering not only access to materials and reactivity that are sometimes difficult or even impossible to access from solution, but also by providing a general answer to the demands of pharmaceutical industry for cleaner, safer and efficient synthetic solutions.[3,4]

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MS36-O3 Last advances in *in situ* monitoring of mechanochemical reactions by X-ray diffraction

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The *in situ* characterization of materials is a widespread technique as it gives an accurate description of the sample in a particular state without disturbing the system and adding supplemental parameters/errors in the measurement. It allows to describe and understand phenomena during a process but it also plays a key role to the development of new materials. The renewed interest of mechanochemistry as an eco-friendly synthetic route has inspired creative methodologies to probe reactions.

One of the last methodologies was developed by Friščić *et al.* and for the first time the progress of milling reactions was monitored by synchrotron X-ray diffraction [1]. Recently, they were able to detect and unveil a new topology intermediate during the mechanochemical synthesis of the metal-organic framework ZIF-8 [2]. Nevertheless, such setup has limitations: it is only adapted for high-energy synchrotron X-rays providing diffraction patterns in a squeezed Q-range with strongly overlapping Bragg peaks and does not yield high quality data. With the aim of improving such situation, we developed a completely different setup yielding higher resolution powder diffraction data and providing continuously a representative part of the bulk for probing [3,4]. The particular geometry of the ball mill designed at Materials Science beamline (SLS, Switzerland) shows a significant improvement of diffraction data quality (Fig.1): new intermediates were precisely identified during ball milling syntheses and crystal structures might be solved from it. Moreover with this novel design, it will be easier and more efficient to couple it with other analytical techniques e.g. infra-red/Raman spectrocopies [5] or laser diffraction analysis.Such setup will be available to users at the MS beamline.

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