Contribution ID: **140** Type: **Premio Nardelli**

Crystal Engineering for storage and release of molecular active ingredients

Monday, 12 September 2022 16:05 (20 minutes)

The ever-increasing attention on environmental problems and sustainability has highlighted several issues related to the use of conventional pesticides in the agricultural industry and the use of more effective food preservatives for the development of active packaging against food waste. In the search for natural antimicrobial and insecticide alternatives, essential oils and their active components have emerged as promising candidates, although they suffer from some drawbacks related to their physical properties. We exploited different crystal engineering approaches to stabilize the active components of the essential oils into the solid-state, either trapping them into flexible metal organic frameworks *via* crystalline sponge methods[1,2] or designing novel cocrystals with the final aim of controlling their release into the environment[3–5]. Wherever possible, and particularly for cocrystals, mechanochemical syntheses were preferred to wet reaction strategies. Providing "greener" and potentially less-expensive strategies than traditional solution methods, mechanochemistry was dubbed by the International Union for Pure and Applied Chemistry (IUPAC) as one of the 10 chemical innovations that will change our world. An excursus on different case studies will be provided with an hint into the mechanistic description of the mechanochemical synthesis via time-resolved in situ monitoring X-ray powder diffraction (TRIS-XRPD).[6,7]

[1] D. Balestri, P. P. Mazzeo, R. Perrone, F. Fornari, F. Bianchi, M. Careri, A. Bacchi and P. Pelagatti, Angew. Chemie Int. Ed., 2021, 60, 10194–10202.
[2] P. P. Mazzeo, D. Balestri, A. Bacchi and P. Pelagatti, CrystEngComm, 2021, 23, 7262–7269.
[3] P. P. Mazzeo, C. Carraro, A. Monica, D. Capucci, P. Pelagatti, F. Bianchi, S. Agazzi, M. Careri, A. Raio, M. Carta, F. Menicucci, M. Belli, M. Michelozzi and A. Bacchi, ACS Sustain. Chem. Eng., 2019, 7, 17929–17940.
[4] F. Bianchi, F. Fornari, N. Riboni, C. Spadini, C. S. Cabassi, M. Iannarelli, C. Carraro, P. P. Mazzeo, A. Bacchi, S. Orlandini, S. Furlanetto and M. Careri, Food Chem., 2021, 347, 129051.
[5] F. Montisci, P. P. Mazzeo, C. Carraro, M. Prencipe, P. Pelagatti, F. Fornari, F. Bianchi, M. Careri and A. Bacchi, ACS Sustain. Chem. Eng., 2022 doi:10.1021/ACSSUSCHEMENG.2C01257.
[6] G. I. Lampronti, A. A. L. Michalchuk, P. P. Mazzeo, A. M. Belenguer, J. K. M. Sanders, A. Bacchi and F. Emmerling, Nat. Commun., 2021, 12, 1–9.
[7] P. P. M. Mazzeo, M. Prencipe, T. Feiler, F. Emmerling and A. Bacchi, Cryst. Growth Des, 2022, doi:10.1021/ACS.CGD.2C00262.

Primary author: Prof. MAZZEO, Paolo (University of Parma)

Co-authors: Dr PRENCIPE, Michele (University of Parma); Dr MONTISCI, Fabio (Università degli studi di Parma); Dr FORNARI, Fabio (Università degli studi di Parma); Dr BIANCHI, Federica (Università degli studi di Parma); Dr CARERI, Maria (Università degli studi di Parma); Dr PELAGATTI, Paolo (Università degli studi di Parma); Prof. BACCHI, Alessia (Università di Parma)

Presenter: Prof. MAZZEO, Paolo (University of Parma)

Session Classification: Session