MS33-P06 | CONTROLLED RELEASE OF NATURAL ESSENTIAL OILS FROM MICROPOROUS METAL-ORGANIC FRAMEWORK

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Hollow molecular structures capable of guest inclusion represent an area of raising interest and lie at the forefront of the modern supramolecular chemistry. After the work on the crystalline sponge method by Fujita, MOFs have been considered as good candidate to confine molecular species even in a post-synthetical procedure due to the fine tuning of their properties, such as porosity and framework flexibility.

We focused on the preparation of porous MOFs that can include a number of organic molecules of nutraceutical interest, (i.e. essential oils, EOs), with the final aim of storing them into the framework and subsequently releasing them in a controlled manner. EOs are natural compounds with strong antibacterial attributes, nevertheless, several of their physical-chemical properties – e.g. high volatility, distinct flavour, low thermal and photo-stability – sometimes hampers their direct use as pure substances. These problems can be overcome including them within the crystalline framework of a properly functionalized MOF.

In particular, we report on the stepwise structural evolution of nanoconfined supramolecular aggregates of pure EO or mixtures of different EOs along the whole loading process inside the cavities of a novel flexible MOF (PUM168, Parma University Material); furthermore, we correlated this phenomenon to the structural reorganization of the host framework, elucidating the dynamic interplay between the container and the content. Finally we investigated the stimulated extrusion of the included guests by head-space GC-MS analyses.

This paves the way to the development of functional materials with potential applications in sensing or in the controlled release of chemicals.