Trimesic acid as a highly efficient scaffold for trapping essential oil terpenoids

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Essential oil terpenoids (EOs) have attracted interest as a class of natural products that exhibit a wide range of medicinal uses, including antiplasmodial, antioxidant, antiviral and anticancer activities. Despite their potential, the low melting point of most terpenoids remains a drawback in their application. Many terpenoids are sensitive to environmental conditions, undergoing volatilization and chemical degradation [1].

To address these challenges, different strategies have been employed to improve stability and bioavailability. The formation of cocrystals composed of essential oil terpenoids [2] and the inclusion of EOs into Metal-Organic-Frameworks (MOFs) [3] largely prevents those outcomes while providing interesting possibilities to tune the release of those pharmacologically active components. However, the formation of specific cocrystals limits the range of EOs to be trapped and the inclusion into MOFs, while a strong proof of concept, is practically hampered by the matrix cost.

In this contribution we present a class of materials composed by the nontoxic and cheap trimesic acid with a wide variety of EOs. The synthesis of the materials is fast, green, cost-effective and effectively wasteless, being based on mechanochemistry [4]. The materials self-assemble in different fashions ranging from cocrystals to Hydrogen-Bonded Frameworks (HOFs), with many cases that do not neatly fall in either category. The materials are extremely efficient in trapping EOs, outperforming the best cocrystals or MOFs ever reported in literature for the release of EOs. On-command release based on external stimuli and the stabilization of the EOs to improve the shelf life of those natural products have also been tackled.

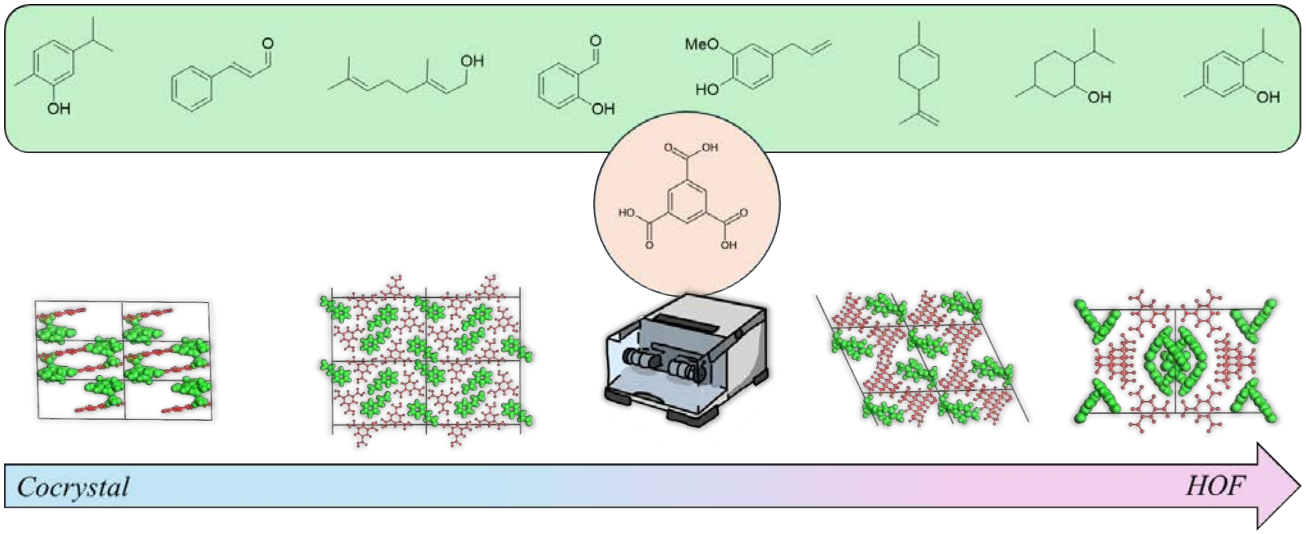

Figure 1. Schematic representation of the EOs employed in this work and selected frameworks of the crystalline phases comprising trimesic acid (red) and various EOs (green).

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