UNIVERSITY OF LIMERICK OLLSCOIL LUIMNIGH | Technology Transfer Office

Licensing Opportunity

CMOM-3S, Chiral Separation Material for Enantiomers

Overview

The Problem: Identification and separation of enantiomers remain a scientific and technological challenge. This is particularly the case in drug discovery and natural product chemistry, where only trace amounts of novel compounds are initially available upon discovery.

Technology

Our Researchers have created a novel porous metal-organic material (MOM) that exhibits the following features exhibits the following features:

i) **Design from first principles**. The new chiral MOM (CMOM-3S) combines tight but adaptable binding sites and is a modular structure. CMOM-3S is therefore proprietary and prototypal for a large family of related materials because each of its components can be interchanged in a modular fashion.

ii) **Extraordinary properties**. CMOM-3S synergistically combines two features that have not previously been brought together in the same material: *1*. the ability to serve as a "crystalline sponge" for structural identification of trace amounts of compound (µg); *2*. tight binding chiral pores that exhibit enantioselectivity.

iii) **Immediate practical utility**. That CMOM-3S can serve as a crystalline sponge means that it can be used to identify molecular structure and chirality with precision on a lab x-ray diffractometer. The ability to function as an enantioselective crystalline sponge coupled with strong thermal and hydrolytic stability enables CMOM-3S to also serve as a chiral stationary phase for chromatographic separation of enantiomers.

Benefits

Advantages over Existing Materials

Low cost: The starting materials for the manufacture of CMOM-3S are commercially available and inexpensive. CMOM-3S is also facile to prepare through a one-step process that enables particle size to be controlled from nm to mm.

Durability: The CMOM-3S coated column was evaluated after 10 months and 1000 injections with no loss of performance.

Versatility: The efficiency of the CMOM-3S column is superior to that of commercial columns (data available).

Applications

HOW DOES CMOM-3S WORK? CMOM-3S enables the introduction of a new analytical method to identify and purify trace amounts of novel or existing chiral or achiral compounds in a manner that was hitherto beyond reach. This is accomplished in a parallel 2-step process:

CMOM-3S as chiral stationary phase (step 1): CMOM-3S is loaded onto the surface of a capillary column through a dynamic coating process. Even this crude column exhibits effective chiral separations of racemic compounds in a manner that is more efficient and more general than leading commercial chiral columns.

UNIVERSITY OF LIMERICK OLLSCOIL LUIMNIGH | Technology Transfer Office

Licensing Opportunity

CMOM-3S as a crystalline sponge (step 2): enantiomer identification can be accomplished using a single crystal of CMOM-3S as follows: (a) a single crystal of CMOM-3S is placed in a microvial to which is added a solution of the target (e.g. 17 μg of the natural product geraniol as shown below); (b) After evaporation to dryness the crystal is mounted on a lab x-ray diffractometer; (c, d) the precise molecular structure of the target is thereby determined. The single crystal can be recycled and used again for a different target.

Commercial Opportunity

The University of Limerick is seeking partners to exploit the commercial potential of these technologies by entering into licensing agreements. This technology is subject to granted European and US Patents

Target Market for Innovation: Pharmaceutical sector

☐Development partner

☐Commercial partner

☒Licensing

☐University spin-out

☐Seeking investment

Patent Title: Chiral Separation Method

Type: Regional

Country: Europe

Status: Granted

Priority Date: 22-Aug-2016

Application number: 16913684.3

Link: *https*://worldwide.espacenet.com/patent/search/family/061245944/publication/EP3500582A1?q=pn%3DEP3500582A1

Patent Title: Chiral Separation Method

Type: Regional

Country: USA

Status: Granted

Priority Date: 22-Aug-2016

Application number: 16/327,784

Link: *https*://uspto.report/patent/grant/10,857,517

Zhang et al., Chem 3, 281–289. 2017. Elsevier Inc. DOI: http://dx.doi.org/10.1016/j.chempr.2017.07.004

https://www.sciencedirect.com/science/article/pii/S245192941730311X?via%3Dihub

UNIVERSITY OF LIMERICK OLLSCOIL LUIMNIGH | Technology Transfer Office

Licensing Opportunity

Contact

Margaret Lawlor

Technology Transfer Office

University of Limerick

email: margaret.lawlor@ul.ie

Figures

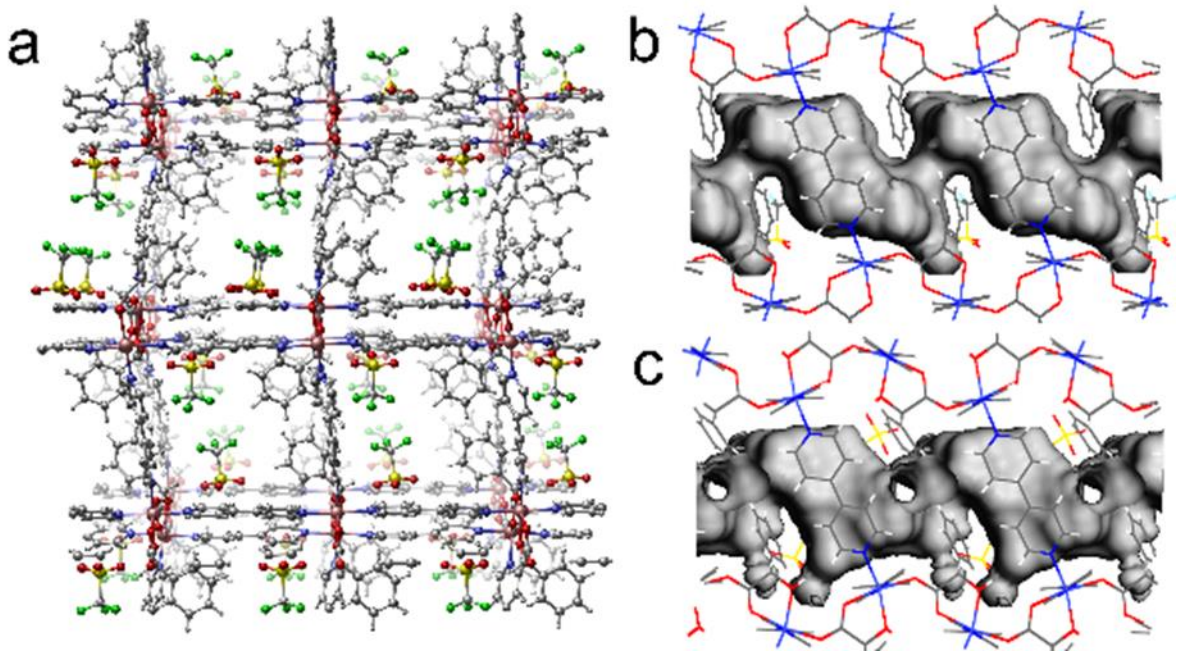

Figure 1: Structural features and interior surface of CMOM-3S. Left: The crystal structure of CMOM-3S, a, reveals the presence of 1D channels (C grey, O red, N blue, F green, S yellow, H white, Co pink). Solvent guest molecules are omitted for clarity. Right: Cross-section of the homochiral channels in CMOM-3S that encapsulate 1,2-dichlorobenzene (b) and isopropanol (c). Rotation of triflate anions and phenyl rings are responsible for the adaptable size and shape of the channel, thereby enabling the accommodation of different guest molecules.