ISTITUTO DI CHIMICA DEI COMPOSTI ORGANOMETALLICI

Consiglio Nazionale delle Ricerche

Mercoledì 4 Marzo 2020

Alle ore 11:00

presso l'aula 2 - Edificio F,

Area della Ricerca CNR, Via Madonna del Piano,10 - Sesto F.no

il Dr. Marco Taddei

Dipartimento di Chimica e Chimica Industriale – Università di Pisa

terrà il seguente seminario:

"Putting empty spaces to a good use: metal-organic frameworks for CO_2 capture"

Si invitano tutti gli interessati a partecipare.

Dr. Andrea Rossin
Ricercatore ICCOM

Dr. Francesco Vizza
Direttore ICCOM

Short Abstract:

Metal-organic frameworks (MOFs) are a class of porous materials built from the connection of organic linkers and metal ions (or clusters thereof) through coordination bonds. The field of MOFs has experienced a tremendous expansion over the last 20 years, driven by the ease to tune the size, shape and physical chemical environment of pores by following the principles of reticular chemistry and judiciously choosing the combination of building blocks. The opportunity to design MOFs "on demand" has made them attractive for a wide range of applications, most notably gas separation and storage. Among many other important gas separation processes, post combustion CO_2 capture from large point sources has become very relevant, due to the urgent need to reduce CO_2 emissions in order to slow down the growth of CO_2 concentration in our atmosphere and mitigate the effects of global warming.

The ideal sorbent for CO_2 capture should selectively bind CO_2 over other species (notably N_2), have a high working capacity, adsorb and desorb with fast kinetics, be regenerated with a little energy input, maintain the performance over a large number of adsorption/desorption cycles and be cost effective. Many MOFs check some of these boxes, not so many check them all.

My research involves the synthesis and structural characterization of MOFs with enhanced stability and the extensive evaluation of their gas sorption properties. The ultimate goal is to understand fundamental aspects of the adsorption mechanism within these materials and develop improved MOF sorbents for CO_2 capture. The three main areas of activity include phosphonate-based MOFs, defect engineering of Zr-based MOFs and perfluorinated MOFs. I will discuss the main achievements, shortcomings and challenges of the proposed approaches and provide an outlook of future directions.

Biographic sketch:

Dr. Marco Taddei received his Ph.D. in 2011 from the University of Perugia (Italy). He stayed in Perugia until 2014, spending a period as a visiting scholar at the University of California, San Diego (USA). In 2015, he moved to Paul Scherrer Institute (Switzerland) and in January 2017 he joined Swansea University (UK) as a Marie Curie Fellow. Since January 2020, he is a Tenure Track Assistant Professor at the University of Pisa. Marco was trained as an organic chemist, but ever since his Ph.D. days his research has mainly focused on the synthesis and structural chemistry of metal–organic polymeric materials, such as metal–organic frameworks and metal phosphonates. In terms of applications, he is primarily interested in using these materials to capture carbon dioxide. He is co-founder of novoMOF, a Swiss-based company producing metal–organic frameworks, for which he serves as scientific advisor.

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