Dipartimento di Scienze Chimiche - Venerdì 22 febbraio 2021, ore 15.00 - 16.30

https://unipd.zoom.us/j/81924142858

Università degli Studi di Padova - UNIPD
Dipartimento di Scienze Chimiche - DiSC

Silvia Gross

Exploration of the chemical parameters space for the low temperature and sustainable hydrothermal synthesis of crystalline inorganic nanomaterials

Synthetic methods yielding nanocrystalline materials at low temperatures have gained a growing interest as environmental concerns have become a more pressing issue. From this point of view, hydrothermal approaches have been the subject of intense research as the nonstandard conditions involved allow reaction pathways to be pursued that would be unavailable at standard pressures and/or temperatures. The exploration of the wide chemical parameters space also supported by Design of Experiment (DoE) approach, has allowed the synthesis of different crystalline nanomaterials under subcritical conditions, at low temperature and with extremely short processing times. In this seminar, the results of seven years of research concerning the synthesis of functional inorganic materials through low-temperature, green hydrothermal synthesis will be presented. In particular the synthesis of ferrites, sulphides, manganites and up-converting sodium-yttrium fluorides, metal nanoparticles will be addressed. The combination of continuous flow with supercritical hydrothermal synthesis (CHFS) will be also outlined along with one case study. Finally, the experimentally challenging issue of following the crystallisation during HT synthesis will be also introduced and contributions of the group in this field will be shown.

Il Direttore DiSC
Michele Maggini

Consiglio Nazionale delle Ricerche - CNR
Istituto di Chimica della Materia Condensata e di Tecnologie per l'Energia - ICMATE

Vincenzo Buscaglia

Hydrothermal reactions: from rocks and minerals formation to synthesis of particles with controlled morphology and organization

Hydrothermal reactions have become very popular for the synthesis of a large number of compounds and materials, either inorganic or hybrid. The term "hydrothermal" usually refers to the crystallisation of substances by means of heterogeneous reactions in aqueous media above 100 °C and 1 atm. Hydrothermal processes are quite abundant in nature because of the large amount of hot water circulating within the Earth's crust. The same processes responsible for the large-scale genesis of many minerals of industrial interest are exploited at the lab scale for the preparation of a variety of particles and nanostructures. The particle size and morphology can be easily controlled acting on several parameters, including solute concentration, temperature and solvent composition. The addition of organic molecules/polymers and/or the use of gels not only affect morphology but also enables non-classical crystallization mechanisms with formation of mesocrystals e other organized structures.

Il Direttore DSCTM
Lidia Armelao

Il Direttore ICMATE
Vincenzo Buscaglia