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Chirality in Inorganic Nanostructures: Fundamentals and Applications

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Conference Room Orio Zanetto, Alfa Building

The introduction of chirality in inorganic nanostructures has enabled the discovery of novel material functionalities with unprecedented tunability through precise structural control. Intrinsic properties of inorganic phases (e.g. catalytic activity, optical response, and toxicity) can be systematically modulated by tailoring the morphological chirality of inorganic nanostructures, while entirely new functionalities may arise from local symmetry breaking. The significant potential of chiral nanomaterials across a wide range of technologically relevant applications has therefore stimulated intensive research into synthetic strategies capable

of controlling mirror-symmetry breaking in inorganic systems. This talk will address: i) the fundamental concepts of chirality in inorganic nanostructures and the chemical characterisation of chirality at the nanoscale; ii) wet-chemical synthetic approaches for the controlled preparation of chiral nanomaterials, with particular emphasis on chiral quantum dots (CdS, AgInS₂, and CuInS₂) and transition metal dichalcogenides (MoS₂, and WS₂); and iii) selected applications in nanomedicine and spintronics, highlighting how chemically driven symmetry breaking governs structure-property relationships.