UNIVERSITÀ DI TRENTO
Dipartimento di Ingegneria Industriale

DII Seminar

Advanced Functional Materials for Water Purification

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Room B108, Polo Ferrari 2 - Via Sommarive 9, Trento

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Conventional technologies for water purification fail to remove some recalcitrant emerging pollutants. Advanced oxidation processes (AOP) can be a suitable alternative in this regard, as they rely on the generation of reactive oxygen species (ROS) in situ and under mild operating conditions. While hydrogen peroxide (H_2O_2) and peroxymonosulfate (PMS) show poor degradation efficiency based on their oxidizing potential, they can produce highly oxidant ROS when catalytically activated. For this reason, it is crucial to develop high-performance catalytic materials for peroxides activation.

Some paradigmatic examples will be provided. A series of nitrogen doped carbon-based materials such as aerogels, carbon nanotubes, and carbon microspheres were developed for PMS activation and applied for the degradation of phenolic compounds and antibiotics.

Several single-atom cobalt and manganese catalysts with asymmetric coordination were synthesized to activate PMS. In particular, it was demonstrated that the formed high valence metal-oxo site is particularly efficient for degradation of organics. Finally, a piezoelectric material ($Au/BiVO_4$) was found to be effective in H_2O_2 production and phenolic compound oxidation upon ultrasound excitation.

Some of the proposed technologies have been already applied at pilot scale for the control of algae blooming and antibiotics removal in real water matrices.

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