Programme: Tuesday 19th June
Room Vermeylen

	Materials processing session Chairman: Tetsuo Uchikoshi		
9h20-9h45	Invited	**Kenjiro Fujimoto**	Materials innovation using combinatorial processing and high-throughput measurement system
9h45-10h05		**Jef Bergmans**	Recycling of spent Cu-based oxygen carriers into high-strength ceramic
10h05-10h25		**Juha-Pekka Nikkanen**	Utilization of CO_2 in modification of galvanized steel surface
	Sustainablility and catalysis session Chairman : Oliver Kappe		
10h50-11h15	Invited	**Pascal Van Der Voort**	Hybrid Materials for Sustainability
11h15-11h35		**Fransesc Sastre-Calabuig**	CO_2 photoassisted methanation on Ru supported Al_2O_3 under solar light irradiation
11h35-11h55		**Carlos Mendoza**	Rose Bengal@MSNs as heterogeneous photocatalysts in photooxygenation reactions
	Environment-related materials Chairman: Yoshikazu Kameshima		
14h25-14h50	Invited	**Kazuya Nakata**	Biological applications of photocatalysis
14h50-15h10		**Daniela Meroni**	Structural and ran properties of N-doped TiO_2/SnO_2 photocatalysts for air pollutant remediation
15h10-15h30		**Giuseppe Granata**	Removal Mechanism of Se(IV) and Cr(VI) from Aqueous Solution by Sulfate Green Rust
	Biomaterials session Chairman: Hirotaka Maeda		
16h40-17h05	Invited	**Kimihiro Yamashita**	Introduction of hydroxyapatite electret for novel biointerface engineering
17h05—17h25		**Sander Leeuwenburgh**	Reinforcement of bioceramics with polymeric particles to obtain self-healing and tough polymer-ceramic composite biomaterials

Structural and electronic properties of N-doped TiO_2/SnO_2 photocatalysts for air pollutant remediation

Daniela Meroni[1], Laura Tripaldi[1], Luca Rimoldi[1], Leonardo Lo Presti[1,2,3]

[1] Department of Chemistry, Università degli Studi di Milano, Via Golgi 19, Milano, Italy
[2] CNR-ISTM, Via Golgi 19, Milano, Italy
[3] CMC, Aarhus University, Langelandsgade 140, DK-8000, Aarhus, Denmark

Introduction

TiO_2/SnO_2 heterojunctions bear relevance to numerous research fields, such gas sensors, fuel cells and photocatalysis [1]. Actually, the isomorphism of SnO_2 cassiterite and TiO_2 rutile (both $P4_2/mnm$) makes them suitable for developing stable junctions. Moreover, the relative positions of the two semiconductors' Fermi energies favour electron transfer from the TiO_2 conduction band to the SnO_2 one, promoting charge carrier separation and increasing the e^--h^+ life-time. In turn, this improves the device efficiency in photo-electrochemical applications with respect to N-doped TiO_2, one of the most investigated visible-light active photocatalysts, which suffers from enhanced recombination of photo-generated charges [2].

Results and Discussion

N-doped TiO_2-SnO_2 photocatalysts were prepared in a broad range of Sn:Ti ratios (0-20%) by three different synthetic approaches (mechanical mixing, seeded growth and co-synthesis), followed by calcination at 400°C. Samples were characterized from the structural, morphological and electronic point of view, also via *in situ* synchrotron radiation-based XAS studies. Structural properties are remarkably modified by the adopted synthetic procedure (Fig.1a). Mechanical mixing leads to mixed phases in almost stoichiometric ratios. The seeded growth gives rise to partial segregation of SnO_2, while for co-synthesis, the only appreciable component is rutile TiO_2, despite the low calcination temperature. Such a tailoring of the structural features reflects in tuneable optical properties (Fig.1b), which show synergistic effects when both N and Sn diffuse in bulk TiO_2. The samples' photocatalytic activity was tested toward the gas phase degradation of VOCs, under both UV and visible light irradiation, monitoring the pollutant disappearance, the main intermediates' formation and the mineralization degree.

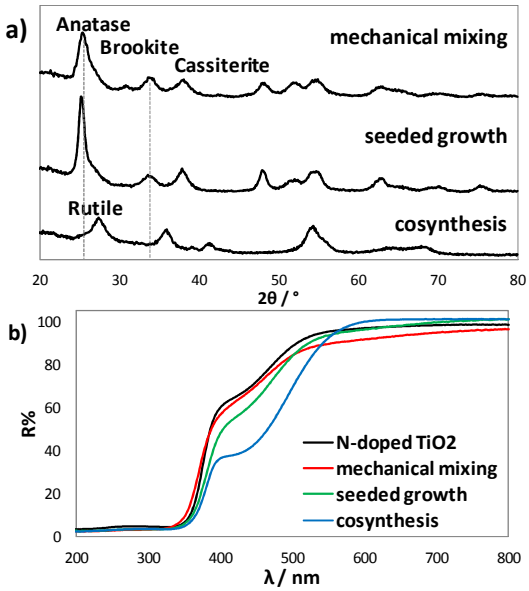

Figure 1: a) XRD and b) DRS of TiNSn20 samples from the three synthetic procedures.

Conclusions

By tuning the synthetic procedure, mixed phases or Sn doping within the TiO_2 matrix could be obtained, leading to different optical and electronic properties. High-resolution XRPD and XAS analyses shed light on (i) the actual location and chemical nature of Sn species, (ii) the defectivity of the TiO_2 lattice, and (iii) the interplay between the dopants. Structural and spectroscopic results were correlated with the photocatalytic activity in the visible region.

References

[1] G. Kelp et al., *Nanoscale*, **2016**, 8, 7056; H. An et al., *Electrochim. Acta,* **2013**, 92, 176.
[2] Asahi et al. *Chem Rev,* **2014**, 114, 9824; Rimoldi et al. *J Phys Chem C,* **2015**, 119, 24410.