The role of the nitrogen source in affecting the features of second generation photocatalysts

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Nitrogen-doped TiO\textsubscript{2} is one of the most promising among all the so-called second generation photocatalysts, i.e., photocatalysts able to exploit solar radiation to initiate the photocatalytic process [1]. N-doping leads in fact to a red shift of the TiO\textsubscript{2} light absorption, otherwise limited to the UV region, resulting in a visible sensitization of the photocatalyst [2]. Different mechanisms were proposed to account for the apparent band gap narrowing. Some researchers attribute this effect to electronic transitions from localized states arising from a mixing of N 2p with the O 2p states. Ihara et al [3] and Serpone et al. [4] affirm, instead, that oxygen vacancies, stabilized by the presence of nitrogen as a result of charge compensation, may act as colour centres, imparting visible light response.

In this work N-doped TiO\textsubscript{2} nanocrystals, obtained by different procedures and adopting different N sources, are analyzed. More specifically, the role of different calcinations atmospheres is investigated together with the effect of the aging of the samples. Structural (by X-ray synchrotron radiation), morphological (HRTEM, BET, granulometry) and optical (DRS) characterizations are compared with data obtained by EPR spectra. The role played by the synthetic route and by the redox conditions of the calcinations on the paramagnetic features is discussed. Specifically the nature of the paramagnetic species, the intensity and the stability in time of the signal are analyzed and cross-compared also with the structural and optical features of the samples.