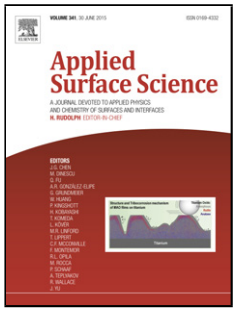


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# Study of phase development and thermal stability in as synthesized $TiO_2$ nanoparticles by laser pyrolysis: ethylene uptake and oxygen enrichment

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## Highlights

- Mixed-phase oxygen abundant $TiO_2$ nanoparticles synthesised by Laser Pyrolysis
- Prevalent anatase stable phase with sizes superior to 30 nm
- Equally mixed phases $TiO_2$ with gradual turbostratic carbon content
- High rutile phase $TiO_2$ synthesis, exhibiting carbon impurities below 1%
- Good thermal stability for anatase titania above 750°C

## Abstract

Laser pyrolysis has proven a viable and trustworthy method of $TiO_2$ nanoparticles fabrication, ensuring good quality and wide variety of nanoparticle morphologies and sizes. This work is aimed to phase control, experimentally studied, by parameter modulation, during one step laser pyrolysis synthesis or in combination with thermal annealing. High phase purity anatase and rutile $TiO_2$ nanoparticles, oxygen abundant, are synthesized from $TiCl_4$ and $C_2H_4$ gas mixtures, in the presence of air as oxygen donor, under $CO_2$ laser radiation. The nano-titania samples are analyzed by X-ray Diffraction, EDAX, TEM and Raman spectroscopy and reveal good phase stability and distinct morphology. This study extends the method applicability onto rutile majoritarian $TiO_2$ synthesis and generation of thermally stable anatase titania, a well-known catalyst.