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## Air Purification by Heterogeneous Photocatalytic Oxidation with Multi-Doped Thin Film Titanium Dioxide

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### Abstract

Multi element-doped titania films (F, S-TiO<sub>2</sub>) were produced via sol-gel techniques and deposited on glass and ceramic substrates with an annealing temperature of 500°C. The films were characterised by X-ray diffraction, Raman Spectroscopy, X-ray photoelectron spectroscopy and scanning electron microscopy. The X-ray diffraction and Raman spectrum showed the films to have an anatase TiO<sub>2</sub> structure with X-ray photoelectron spectroscopy confirming the presence of sulphur, fluorine and carbon doping. The titania coated glass and ceramic substrates were compared against two commercially available TiO<sub>2</sub> coated products for the photo-destruction of NO<sub>2(g)</sub>. The study included both equivalent indoor and outdoor test conditions. The multi-doped titania films were shown to provide a genuine method of air purification under both visible (room lighting) and UVA lighting with photo-destruction rates as high as 72%.

**Keywords:** TiO<sub>2</sub>, Thin Film, Photocatalysis. Anion Doping

### Introduction

Environmental pollution is a multifaceted issue that poses many environmental and structural problems and significant health risks. Air pollution presents itself in many forms such as suspended particulate matter, gases or odours. The World Health

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