

Densities of active species in N₂ RF and HF afterglows

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N₂ flowing afterglow emissions have been analyzed by optical emission spectroscopy in tubes of 21 and 18 mm internal diameter connected to RF and HF sources available in Suwon and Toulouse, respectively. The N₂ 1st pos (580 nm), 2nd pos (316 nm) and N₂+ 1st neg (391.4 nm) band system intensities were recorded across the tube diameters from the pink (early) to the late afterglows at pressure 6-8 Torr, total flow rate 0.5-0.6 slm and input power of 100 watt. After calibration of the N atom density by NO titration, the concentrations of N-atoms, O-atoms coming from gas impurities, N₂(X, v>13), N₂(A) metastable molecules and N₂⁺ ions were determined in N₂ afterglows. It is found that N-atom density nearly constant from the pink to the late afterglow. For similar afterglow times, active species densities are higher in HF than in RF: 2 and 0.4x10¹⁵ cm⁻³, respectively. Anatase nanocrystals

and ALD (Atomic Layer Deposition) TiO₂ samples were exposed to the RF and HF afterglows at room temperature. XPS analysis of samples submitted to the RF afterglow has shown that the best N/Ti coverage: 0.24 was obtained in the N₂ late afterglow where the N atoms are the most populated active species. In the HF late afterglow, the N/Ti coverage was limited to 0.04 in spite of higher N-atom density: (1-2)x10¹⁵ cm⁻³. Such results are explained by higher O-atom impurity in HF: 2x10¹³ cm⁻³ in comparison to 8x10¹¹ cm⁻³ in RF. Then, the N/O ratios in the RF and HF afterglows were respectively (0.5-1)x10² and 5x10² with the same variations as found for the N/Ti coverages.

Biography

A Ricard worked at Ecole Polytechnique as a physicist from (1960-1962). Then from 1962-1964 he worked at Institut Optique as Engineer, from 1964-1967 worked at Sud-Aviation as Engineer, from 1967- 2007 he worked as a researcher in CNRS. He received his PhD in 1971 from University of Toulouse. He is expertise in the field of plasma spectroscopy, kinetics of plasma excited species, applications to surface treatments.

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