

## **Time resolved diagnostics and kinetic modelling of a modulated hollow cathode discharge of NO<sub>2</sub>**

**Abstract:** The transients associated with the ignition and the extinction of the cold plasma produced in a low frequency, square-wave modulated, hollow cathode discharge of nitrogen dioxide are characterized by time resolved emission spectroscopy, mass spectrometry and electrical probes. The temporal evolution of the concentrations of neutral species created or destroyed in the NO<sub>2</sub> discharges are compared with the predictions of a simple kinetic model previously developed for discharges of other nitrogen oxides (N<sub>2</sub>O and NO). The physical conditions of pressure, gas flow rate, modulation frequency and electrical current in the NO<sub>2</sub> plasma were selected in order to highlight the time-dependent behaviour of some of the stable species formed in the discharge, especially the nitrogen oxide products, whose concentrations show transient maxima. The usefulness of the analysis of the transient results is emphasized as a means to evaluate the relevance of the different elementary processes and as a key to estimate the values of some of the rate constants critical to the modelling.