# $CO_2$ conversion by nanosecond repetitively pulsed (NRP) discharges: process design, efficiency and experimental investigation of the kinetics

**Paolo Tosi**
*Dipartimento di Fisica, Università di Trento, I-30123 Trento Italy*

Plasma reforming of $CO_2$ is potentially attractive for the storage of renewable electrical energy in chemical form. The present approach to plasma conversion issues relies on: a) technological efforts devoted to discharge design and coupling with heterogeneous catalysts; b) measurement of stable products in the gas downstream by analytical techniques; c) computer modelling of the plasma chemistry and comparison with the experimental results. Needless to say, a deeper understanding of the process requires both a realistic modelling of the discharge and an experimental investigation of the chemical kinetics running under discharge and post-discharge conditions. The last aim can be pursued by time-resolved diagnostics of both transient and stable species, like laser-induced fluorescence (LIF). However, in a filamentary discharge regime, it is critical to localise the measurement within the filament region, where transient species have their maximum concentration and where their reactions are mostly influencing the local kinetics. On the contrary, spatially and temporally averaged radical density measurements, like those done in a volume DBD discharge, cannot give a correct interpretation of their kinetics. This talk describes recent results from the author's group (G. Dilecce, N. Gatti, L.M. Martini, S. Lovascio, M. Scotoni) obtained by using an NRP point-to-sphere discharge, designed for optimising both the $CO_2$ conversion and the simultaneous LIF measurements.