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Mechanism of Ethane Destruction in Dielectric Barrier Discharge in Air: Detailed Elementary Reaction Model and Experiment
LEV KRASNOPEROV, CAMILA MODENESE, LARISA KRISHTOPA, New Jersey Institute of Technology — Free radical destruction mechanism was extended by inclusion of reactions of excited and ionic species. The mechanism consists of 935 reactions of 85 neutral species, 9 excited states and 38 ions. The reactions include 9 initiation processes in streamers, 66 processes involving excited states and 83 reactions involving ions. The reactant, the final products as well as the major intermediates of the destruction of ethane in air in corona discharge were identified and quantified Carbon dioxide (CO_2), water (H_2O), formaldehyde (H_2CO), acetaldehyde (CH_3CHO), methanol (CH_3OH), ethanol (C_2H_5OH), formic acid (HCOOH), acetic acid (CH_3COOH), methyl nitrate (CH_3ONO_2) and ethyl nitrate ($C_2H_5ONO_2$) were identified among the major destruction products. The destruction efficiency predicted by the mechanism is in good agreement with the experiment, the major contribution is being due to the ionization transfer reactions. Reactions of excited species play but only a minor role. The product spectrum is consistent with the subsequent low temperature free radical reactions complicated by the presence of ozone and nitrogen oxides. The generic reaction mechanism for other organic as well as inorganic compounds is discussed.

Lev Krasnoperov

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