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Plasma chemical processes in cold atmospheric-pressure plasma jets for biomedicine

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Cold atmospheric-pressure plasmas have recently attracted a great interest owing to their high efficiency in production of reactive species for biomedical applications. Among most widely used sources of such plasmas are atmospheric-pressure plasma jets (APPJs) formed by pulsed corona or barrier discharges inside thin dielectric tubes in flows of various plasma forming gases typically noble gases, pure or with molecular admixtures, emerged from the discharge tubes into ambient air. At pulse repetition frequencies in the kilohertz range the APPJs are typically composed of bullet-like plasma plumes - streamers travelling along the jets. Reactive species excited atoms and molecules, radicals, charged species in these APPJs are produced by streamers not only in discharge regions inside the tubes but along the whole jets. Due to this property, the APPJs operating in the plasma bullet mode are capable to deliver fluxes of various reactive species, including those with short lifetimes e.g., oxygen atoms, directly to treated objects. Composition of produced reactive species is rather complex, including several tens of various sorts, so that it is a very difficult task to obtain it in experiment typically, densities of only several sorts of species are measured. In this respect, for evaluation of the whole set of reactive species densities the use of computational methods is of high importance. In the talk, results of computational studies on the production of reactive species by APPJs operating in the plasma bullet mode are summarized.

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