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Finite element analysis of the plasma needle-biomaterial interaction at atmospheric pressure YUKINORI SAKIYAMA, DAVID GRAVES, University of California at Berkeley — The atmospheric pressure RF-excited plasma needle is a non-thermal discharge sustained at the sharp tip of a needle in helium gas flow. The plasma needle has been applied to various biomedical applications. However, the mechanisms of the plasma-biomaterial interaction are only poorly understood. In this study, we focus on influences of humid air diffusing into the discharge domain on plasma chemistry. Our fluid model includes 49 species and over 700 elementary reactions in one-dimensional spherical coordinates. An expected concentration gradient of humid air is assumed to be present due to back diffusion of air against helium convective flow. Our simulation results indicate that O2+ and N2+ are dominant ions at the outer electrode corresponding to the biomaterial surface and that the most abundant neutrals near the outer electrode are O, O2*, and OH radicals. These results suggest that trace amounts of humid air can play a central role in plasma needle treatment.

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