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A real-time, passive, and spatially resolved RONS dosage diagnostic of plasma medicine: A reversed computation of optical emission spectra using artificial neural network.[1] LI LIN, MICHAEL KEIDAR, The George Washington University, MPNL TEAM — It is well-known that reactive oxygen and nitrogen species (RONS) play a key role in plasma medicine applications. At the current stage, two critical points are required to be solved. First, due to the difference among cell responses during cold atmospheric plasma (CAP) treatments, an optimized RONS dosage must be found for each case to maximize the selectivity. Moreover, such optimized dosages can be dynamic during treatments. Therefore, the second point is to develop a self-adaptive plasma treatment that can automatically optimize the plasma parameters and its chemistry in real-time. To achieve these two goals, we developed a real-time RONS dosage diagnostics method for CAP plume based on the real-time measurement and reversed computation of the optical emission spectrum (OES). Due to the complexity of 800+ chemical reactions behind the OES, we developed a novel mutation-evolution algorithm of an artificial neural network to compute the species composition based on the OES signals. The well-trained neural network is thus not only able to be a core of future self-adaptive plasma treatments but also potentially to be a diagnostic for other types of plasmas, such as the pulsed arc for nanomaterial synthesis and electrical propulsion plumes.

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