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Production of atomic oxygen in an atmospheric pressure arc in air and its implications for NO₂ generation¹ MATTHEW R. KING, CHRISTOPHER J. OLDHAM, JENNA R. PUCKETT, JEROME J. CUOMO, Department of Materials Science and Engineering, NC State University — Given the complexities associated with air plasma chemistry, it is important to understand the formation mechanisms of common reaction products such as NO₂. Ground state atomic oxygen (OI) is found to be an indicator of NO₂ formation, as it has been observed that the availability of OI, determined from line emission at 777 nm, has a direct correlation to NO₂ production. In particular, we find a post-discharge reaction involves the consumption of OI for a two-fold increase in NO₂. This work investigates the parameters affecting OI generation in an atmospheric pressure arc in air. In order to fully understand the dynamics of this relationship, we have studied the effect of applied power, frequency, nitrogen to oxygen mixing ratio, and gas temperature on OI emission. The data is also compared to a theoretical kinetic model available in the literature that includes various ionic, neutral, and excited metastable species. This work has implications for all air-based plasma applications, given NO₂ is a ubiquitous, and toxic, byproduct of these discharges.

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