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Actinometry of Atomic Fluorine in a Capacitively Coupled Discharge with a mixture of SF₆ and O₂¹ SHARATH BABU, PAUL SWIFT, STEPHEN DANIELS, MILES TURNER, Dublin City University — Actinometry is a well-known technique for determining neutral species densities in reactive plasmas using optical emission spectroscopy. The basic idea is to compare the intensity of two emission lines, the first from a species of known density, and second from a species whose density is to be determined. Clearly, this approach succeeds only if the relationship between the relevant line intensities and the species densities is known. Actinometric measurement of atomic fluorine density is of special interest because alternative techniques, such as laser induced fluorescence, are impractically difficult for most purposes. In this paper we discuss actinometric measurement of fluorine densities in mixtures of SF₆ and O₂. In this system, the atomic neutral radical densities are a complex function of the gas mixture. Comparison of the actinometric data with mass spectrometric measurements shows that under many conditions they are proportional, so that ideal actinometric behaviour is observed. We show that this behaviour is predictable on the basis of a recently calculated excitation cross section for fluorine emission line. Hitherto, actinometry of fluorine has depended on difficult empirical calibration procedures.

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Miles Turner
Dublin City University

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