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A benchmark study of the global model approximation D.D. MONAHAN, M.M. TURNER, Dublin City University — Global, or volume-averaged, plasma chemistry models have been widely used in low temperature plasma physics. The assumptions and simplifications typically associated with these models severely limits the parameter domain over which they may be applied. Well defined boundaries to these domains, however, do not appear to have been established. Often only minimal model validation is offered in the literature. The aim of this project is to critically evaluate the performance of an elementary global model over a range of parameters and gas compositions by comparing such a model to a set of benchmark particle-in-cell simulations in Ar/O_2 mixtures. These simulations cover a wide range of conditions in terms of collisionality, electronegativeity, and negative ion destruction mechanism. It is found, as expected, that the most significant limitation of the model appears to be the oft-used assumption of a Maxwellian electron energy distribution. Adopting the modifications proposed in [1] is shown to be a significant improvement upon this assumption. It is also found that acceptable model-simulation agreement can be obtained without accounting for the complex spatial structures observed in these discharges.

[1] Gudmundsson, J. T., *On the effect of the electron energy distribution on the plasma parameters of an argon discharge: a global (volume-averaged) model study*, Plas. Sourc. Sci. Technol., **10** (2001), 76-81

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