

Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Optimal conditions for nitric oxide synthesis by a plasma process¹

MILES TURNER, CEZAR GAMAN, Dublin City University, GARY J. LANIGAN, Teagasc — Nitrogen is an important element in plant growth, and consequently access to nitrogen in chemically active forms is essential to modern agriculture. Molecular nitrogen, however, is practically inert. Conversion of molecular nitrogen to biologically useful forms, known as fixation, is an energetically intensive process that is predominantly effected by consuming fossil fuels and emitting carbon dioxide via the Haber-Bosch process. This makes a large contribution to greenhouse gas emission, and consequently to anthropogenic climate change. A plasma process might prevent these emissions, by replacing fossil fuels with renewable energy sources, and thus contribute to addressing one of the most important challenges of the present century. The energy efficiency of the plasma process is an important consideration. We show that an analytic model can describe the most salient processes involved in plasma nitrogen fixation, and that this model implies that the energy efficiency of such a plasma process could be as much as 20 %. However, there is an apparently unavoidable compromise between yield (or molar conversion efficiency) and energy efficiency, which suggests that a practical expectation is around 10

¹Science Foundation Ireland IA/16/4628

Miles Turner
Dublin City University

Date submitted: 03 Jun 2019

Electronic form version 1.4