Abstract Submitted
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Modelling nitrogen fixation by electron-beam sustained discharges MILES M. TURNER, Dublin City University — Nitrogen fixation is a plasma application recently attracting renewed interest. Nitrogen is an essential biochemical. However, atmospheric nitrogen is almost inert, so that nitrogen is scarce in the biosphere, and access to nitrogen is a major limiting factor on plant growth, and hence agricultural productivity. Converting atmospheric nitrogen into biologically useful forms such as nitrates is known as nitrogen fixation. Artificial nitrogen fixation is now achieved by a fossil fuel powered process (Haber-Bosch). Continued use of this method is likely unacceptable on environmental grounds, and alternatives are consequently being sought. A plasma process driven by electricity from renewable resources is an alternative. Major challenges in this context include reaching acceptable efficiency, and operating on a sufficiently large scale. Electron-beam sustained discharges are a promising avenue, since they offer to produce large volume plasmas at atmospheric pressure under closely controlled conditions. This paper will discuss a modelling study investigating the operation of such discharge for nitrogen fixation. We will show that energy efficiency close to Haber-Bosch appears possible (with appreciable uncertainty, however).

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