Modeling of cold atmospheric-pressure plasma discharge for the synthesis of ammonia as a carbon-free liquid fuel

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Abstract: Reliable technologies for the storage of renewable energy is critical for their widespread adoption. Environmentally friendly carbon-free ammonia fuels generated in situ at the renewable energy source from freely available resources is attractive. We propose a computational model-based understanding of a novel cold atmospheric-pressure plasma process for the production of the ammonia fuel from water and air as inputs. The model will provide a comprehensive representation of physical and chemical phenomena in the process, including plasma dynamics and reactive chemistry of fuel processing. The modeling will establish viability of the process as a new platform technology in the renewable energy economy. The proposed work will also develop a new version of the plasma simulation tool that leverages coarse and fine-grained parallelism enabled by HPC node architectures with GPU support.