CAE-Based Design and Optimization of a Plasma Reactor for Hydrocarbon Processing

F. A. Cassini¹, N. Padoin², C. Soares²

¹Federal University of Santa Catarina (UFSC), Department of Chemistry (QMC), Laboratory of Physical-Chemistry of Plasmas, Florianópolis 88040-900, SC, Brazil.
²Federal University of Santa Catarina (UFSC), Department of Chemical and Food Engineering (EQA), Laboratory of Energy and the Environment (LEMA), Florianópolis 88040-900, SC, Brazil.

E-mail: cassini.felipe@gmail.com; natan.padoin@posgrad.ufsc.br; cintia.soares@ufsc.br

**Introduction**

Plasma reactors can be applied to the conversion of waste, biomass and fuel to synthesis gas (H₂ + CO₂) with efficiencies as higher as 90-95% and low energy demand.

**Objective**

Apply a multi-step approach for the investigation of the main physics involved in a rotating gliding arc (RGA) discharge reactor used for hydrocarbon processing.

**Method**

Fluid flow, chemical reactions and electromagnetic field at the electrode dictate the system stability.

**Results**

Transitory discharge (thermal/non-thermal plasma). High electron density and energy at moderate temperature. Once the discharge is ignited, it moves pushed by the flowing gas. The movement of the arc increase the voltage demanded to sustain the process. The maximum voltage required corresponds to the breakdown value.

**Conclusions**

We have used a workflow, with COMSOL Multiphysics at the core, for phenomenological understanding and application design of RGA reactors. This procedure will help us to translate the technology developed at laboratory bench scale to real field applications.

**References**


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