Abstract Submitted
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CFD Modeling of a Laser-Induced Ethane Pyrolysis in a Wall-less Reactor[1] OLGA STADNICHENKO, VALERIY SNYTNIKOV, Borsekov Institute of Catalysis, JUNFENG YANG, OMAR MATAR, Imperial College London — Ethylene, as the most important feedstock, is widely used in chemical industry to produce various rubbers, plastics and synthetics. A recent study found the IR-laser irradiation induced ethane pyrolysis yields 25% higher ethylene production rates compared to the conventional steam cracking method. Laser induced pyrolysis is initiated by the generation of radicals upon heating of the ethane, then, followed by ethane/ethylene autocatalytic reaction in which ethane is converted into ethylene and other light hydrocarbons. This procedure is governed by micro-mixing of reactants and the feedstock residence time in reactor. Under mild turbulent conditions, the turbulence enhances the micro-mixing process and allows a high yield of ethylene. On the other hand, the high flow rate only allows a short residence time in the reactor which causes incomplete pyrolysis. This work attempts to investigate the interaction between turbulence and ethane pyrolysis process using large eddy simulation method. The modelling results could be applied to optimize the reactor design and operating conditions.

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