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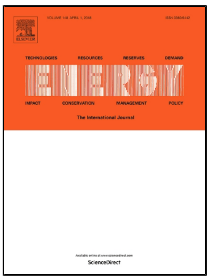

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Development of multi-component surrogates of diesel from indirect coal liquefaction for spray analysis

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Abstract

The aim of this work is to develop surrogates for the diesel from indirect coal liquefaction (DICL) using a model-based surrogate formulation methodology to emulate the fuel chemical and physical properties affecting the spray process and the ignition delay period. The detail compositions and the temperature-dependent physical properties (density, viscosity and surface tension) of DICL were firstly measured in this work to provide required data for the surrogate formulation method. Three surrogates were developed, which consist of six, four and two components (S1, S2 and S3). Surrogates S1 and S2 can well emulate all the temperature-independent and the temperature-dependent properties, while the S3 can only represent a part of these properties, especially the cetane number (CN) and distillation curve of S3 seriously deviate from the experimental data with deviations of -11.1% and 6.24% respectively. The three newly developed surrogates were used to predict the spray characteristics of the real DICL in the conditions with room temperature. Results show that the three surrogates can well reproduce the spray behaviors of the real DICL.

Keywords: surrogate fuel; diesel from indirect coal liquefaction; fuel properties; atomization; spray