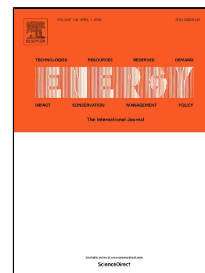


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Development of multi-component surrogates of diesel from indirect coal liquefaction for spray analysis

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# 1 Development of multi-component surrogates of diesel from 2 indirect coal liquefaction for spray analysis

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8

## 9 Abstract

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

25

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

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