Spectroscopy study of partially premixed combustion in a light-duty optical engine

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Broadband Analyzing

Table Operating

Conditions:

<table>
<thead>
<tr>
<th>Case</th>
<th>Injection timing</th>
<th>CA50</th>
<th>Intake temperature</th>
<th>Oxygen</th>
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<td>8 CAD</td>
<td>323 K</td>
<td>19.0 %</td>
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<tr>
<td>B</td>
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<td>9 CAD</td>
<td>348 K</td>
<td>19.0 %</td>
</tr>
<tr>
<td>C</td>
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<td>9 CAD</td>
<td>348 K</td>
<td>18.8 %</td>
</tr>
<tr>
<td>D</td>
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<td>10 CAD</td>
<td>343 K</td>
<td>19.0 %</td>
</tr>
<tr>
<td>E</td>
<td>-15 CAD</td>
<td>10 CAD</td>
<td>413 K</td>
<td>18.8 %</td>
</tr>
</tbody>
</table>

Results

Effect of SOI (Stratification):

Conclusions

- Broadband chemiluminescence, a collective name for CO2*, HCO* and CH2O* chemiluminescence, makes up the majority of the spectrum for HCCI combustion. For decreasing ID, OH*, CH* and C2* chemiluminescence increase.

- Analyzing the in-cylinder combustion by means of optical filters should be done with care, since a significant broadband chemiluminescence signal is transmitted as well for both PPC and HCCI regimes.

- Broadband chemiluminescence can also be used as a measure for the heat release rate. This implies that, although OH* chemiluminescence is absent in HCCI combustion, OH* broadband filters can be used to map the local rate of heat release in the combustion chamber. However, further fundamental investigation is required for validation when different combustion parameters are used.