

## Investigation of the cooperative-effects of Lewis- and Brønstedt acids in homogeneously catalyzed OME fuel synthesis by inline-NMR monitoring

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### Supporting Information

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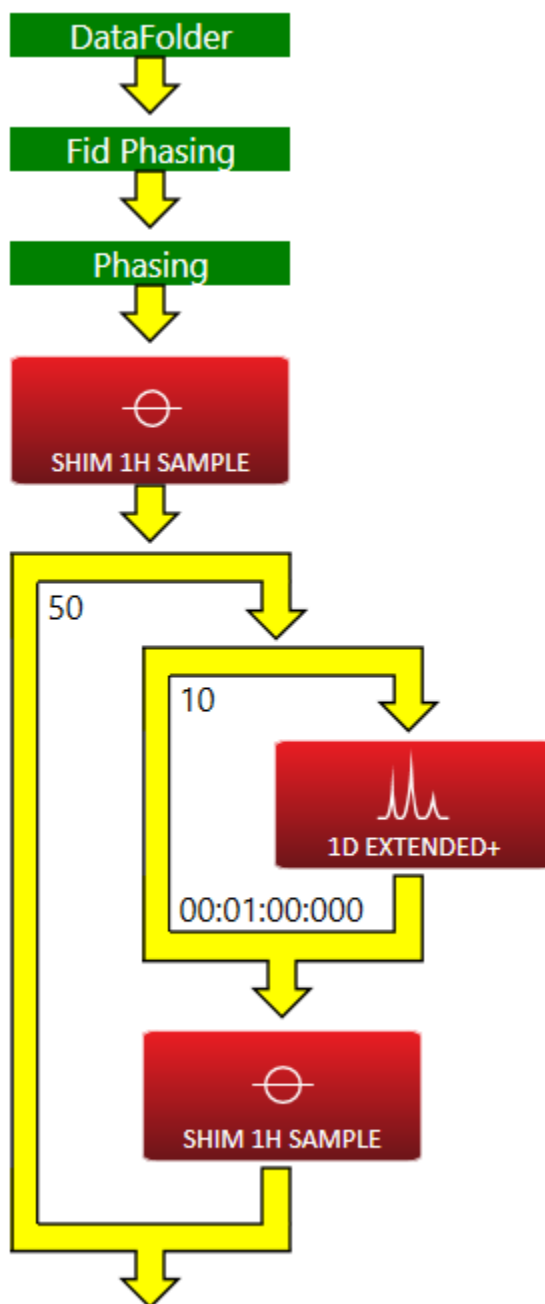
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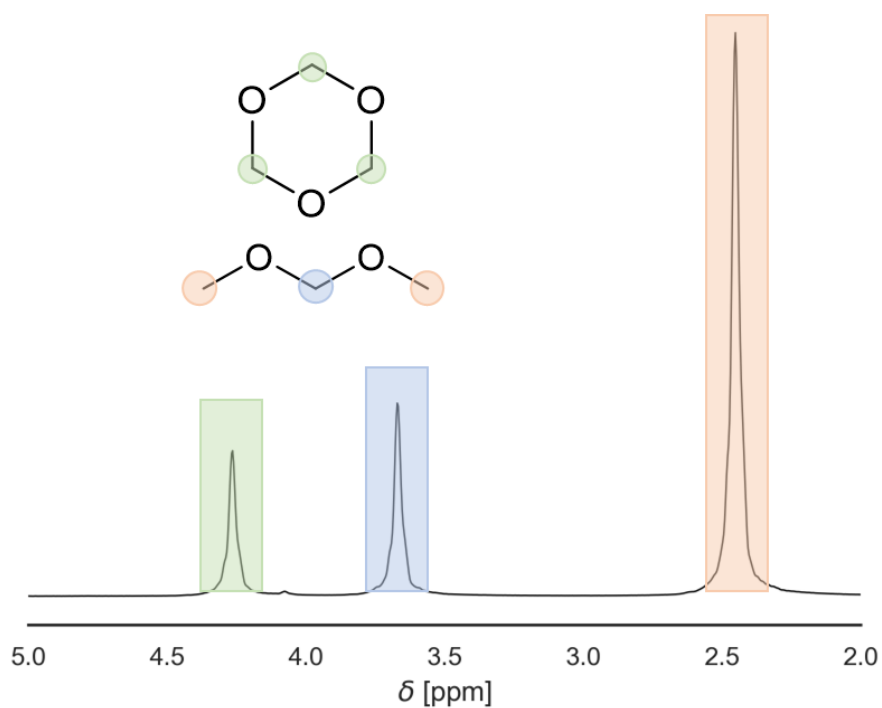
## 1. NMR measurement cycle

The NMR measurements were started with an initial shim on sample, and then  $^1\text{H}$  NMR spectra were acquired. This process was repeated ten times before conducting another shim on sample. This entire cycle of measurements and shimming was repeated up to a maximum of 50 times. (Fig. S1)

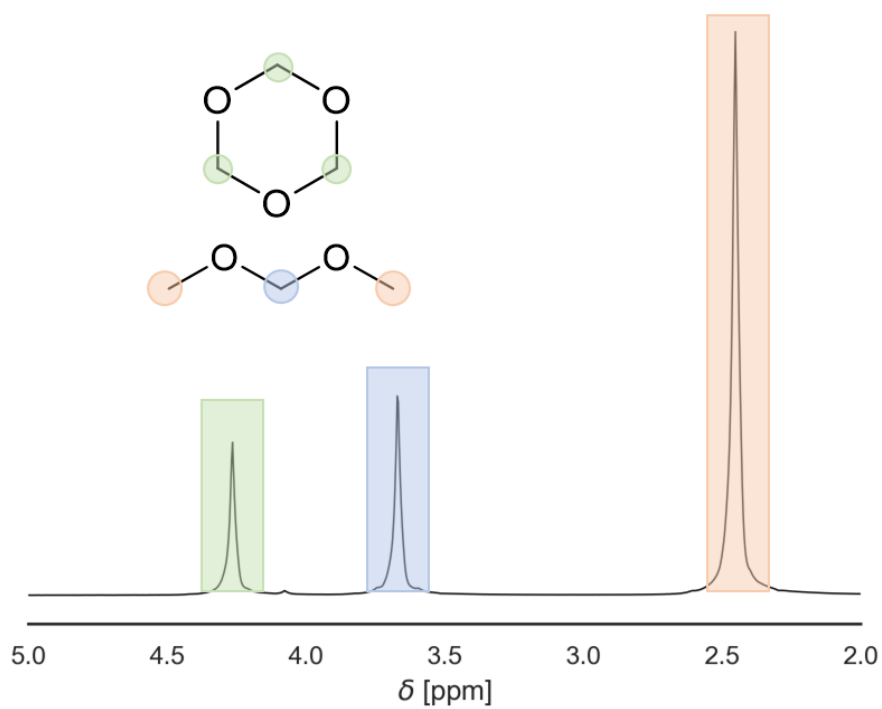


**Figure S1:** Analytic cycle of the online NMR measurements.

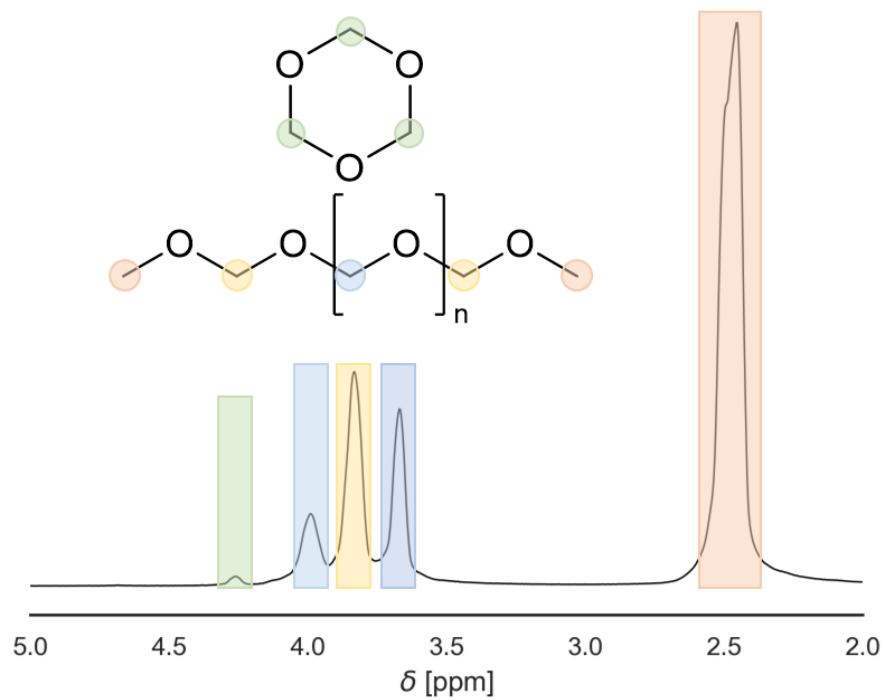
## 2. $^1\text{H}$ NMR measurements at selected reaction times



**Figure S2:**  $^1\text{H}$  NMR spectrum after reactor loading, dimethoxy methane 150 g, trioxane 44.4 g,  $\text{ZnCl}_2$  17.5 mmol  $\text{L}^{-1}$ , 20 °C (43 MHz).

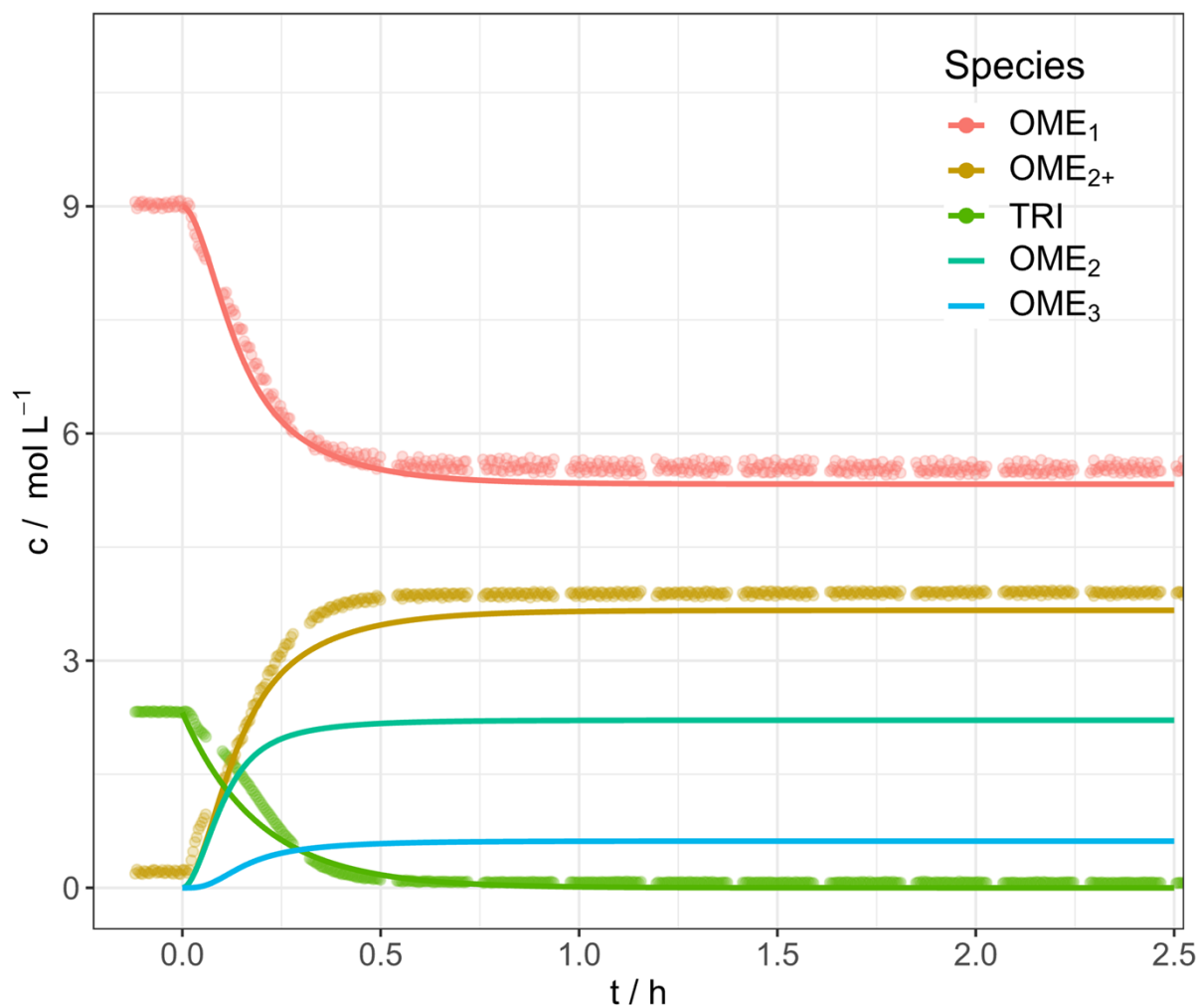


**Figure 3:**  $^1\text{H}$  NMR spectrum after 20 min prior to the addition of the Brønsted acid catalyst, dimethoxy methane 150 g, trioxane 44.4 g,  $\text{ZnCl}_2$  17.5 mmol  $\text{L}^{-1}$ , 20 °C (43 MHz).



**Figure 4:**  $^1\text{H}$  NMR spectrum after 120 min at equilibrium conditions, dimethoxy methane 150 g, trioxane 44.4 g, triflic acid  $13.5 \text{ mmol L}^{-1}$ ,  $\text{ZnCl}_2$   $17.5 \text{ mmol L}^{-1}$ ,  $20^\circ\text{C}$  (43 MHz).

### 3. Kinetic fitting of molar share over time



**Figure 6:** Experimentally extracted concentrations of OME<sub>x</sub> over time with kinetic fits, dimethoxy methane 150 g, trioxane 44.4 g, triflic acid 13.5 mmol L<sup>-1</sup>, ZnCl<sub>2</sub> 2.9 mmol L<sup>-1</sup>, 20 °C.