Electronic Supplementary Material (ESI):

Methane Formation Mechanism in the Initial Methanol-to-Olefins Process Catalyzed by SAPO-34

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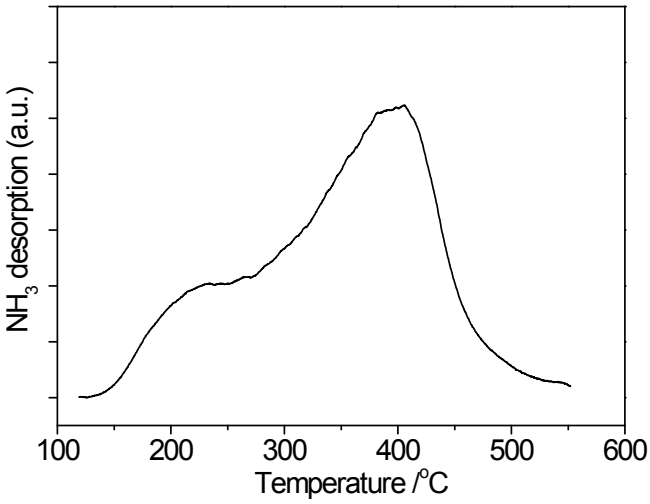

Fig. S1 NH_3-TPD profile of FC-SAPO-34

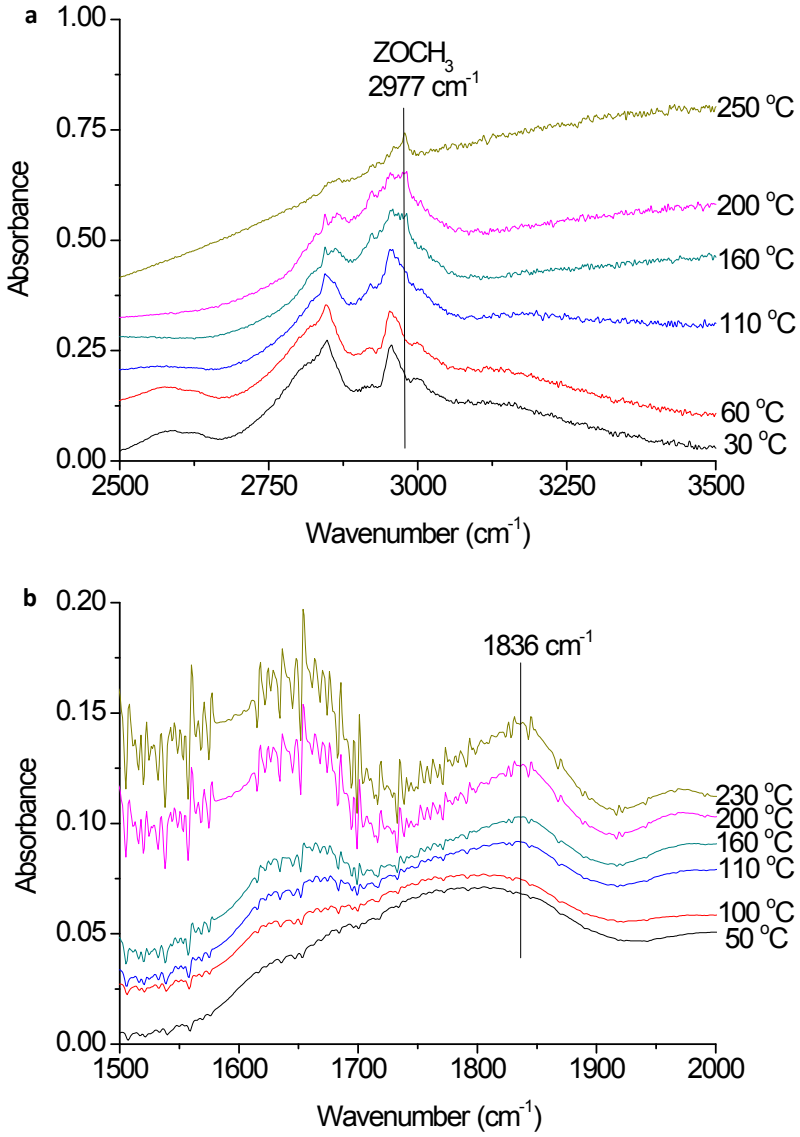

Fig. S2 Differential IR spectra for formation of carbonyl groups from $ZOCH_3$ and methanol. (a) reaction of ZOH and methanol at different temperatures, showing that $ZOCH_3$ was formed at 160 °C (IR spectrum of ZOH at 30 °C was used as background); (b) reaction of $ZOCH_3$ and methanol (IR spectrum of $ZOCH_3$ at 30 °C was considered as background).

Fig. S2 shows that a new band appears at 1836 cm^{-1} in the IR spectra obtained by following the reaction of methanol with SMS at different temperatures, and it increases in intensity with the reaction temperature. This indicates formation of carbonyl group-containing species, and its amount increases with the reaction temperature.

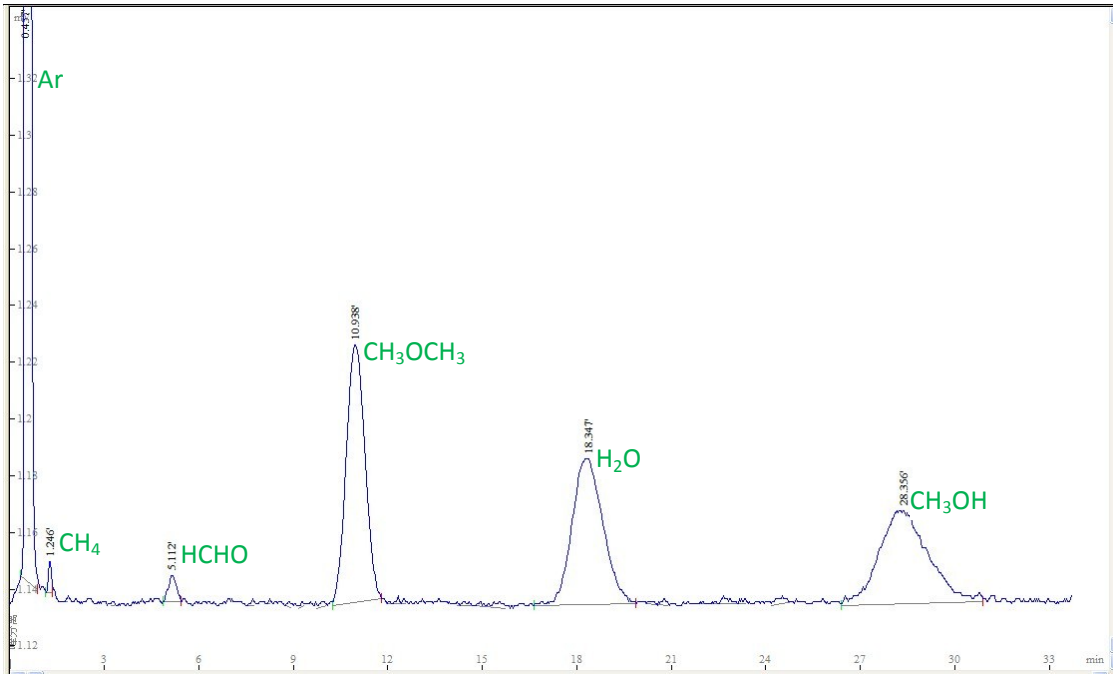

Fig. S3 The chromatogram for the products obtained by pulsing methanol to FC-SAPO-34 at 400 °C (corresponding to the pulse 1 (methanol) in Table 1). Experimental conditions: 100 mg of FC-SAPO-34 was first pretreated at 550 °C for 2 h in air before the reaction. The reaction was carried out at 400 °C with Ar as carrier gas, the flow rate of which was 300 mL/min. 0.07 mmol of methanol was injected. The chromatogram was obtained on Shimadzu GC-2014C equipped with a Propark-T column and a TCD detector).