Supplementary Information

Preparation of $KF/La_2O_2CO_3$ Solid Base Catalysts and their Excellent Catalytic Activities for Transesterification of Tributyrin with Methanol

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1. TG-DTA curves of of the 25%$KF/La_2O_2CO_3$ precursor

The calcination temperatures were chosen by TG-DTA test. Fig. S1 shows the TG-DTA curves of the precursor of the 25%$KF/La_2O_2CO_3$ catalysts. It can be found that the mass is almost no decrease in the temperature range from 303 K to 973 K (only 1.34% loss) in the TG curve. However, DTA curve shows an exothermic peak at 565 K, which are attributed to the phase transformation. Thus, the calcination temperatures were chosen above the temperature of the phase transformation.

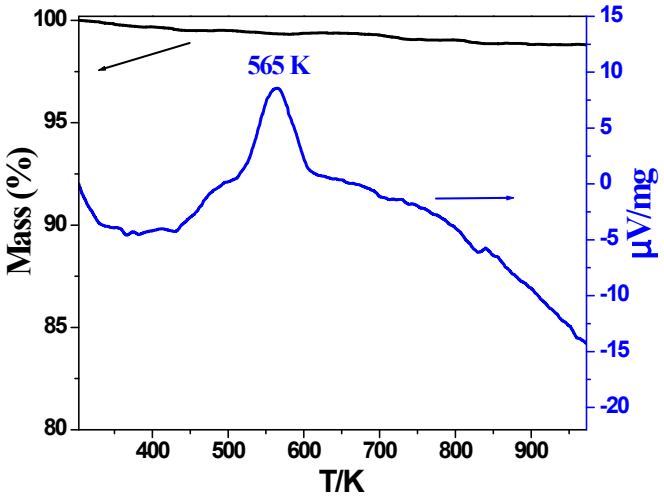

Fig. S1 the TG-DTA curves of the 25%$KF/La_2O_2CO_3$ precursor

2. ^{1}H NMR spectroscopy of methyl butyrate

Tributyrin, dibutyrin, monobutyrin, glycerol and methyl butyrate in the liquid product were identified by GC-MS (Agilent 6890/5973N). In addition, the obtained methyl butyrate can also be identified using ^{1}H NMR spectroscopy. A detailed process is as follows: firstly, the reaction

mixture was centrifuged to separate the catalyst, and then the liquid products were distilled in order to separate the methyl butyrate from the products, it is found that only the distillate at 64 ºC can be collected that was analyzed by GC-MS and ^{1}H NMR spectroscopy. The results of GC-MS show that the distillate at 64 ºC is azeotrope of methanol and methyl butyrate. ^{1}H NMR spectroscopy was carried out using MeOD as solvent for the distillate at 64 ºC shown in Fig. S2. The results confirm the formation of methyl butyrate.

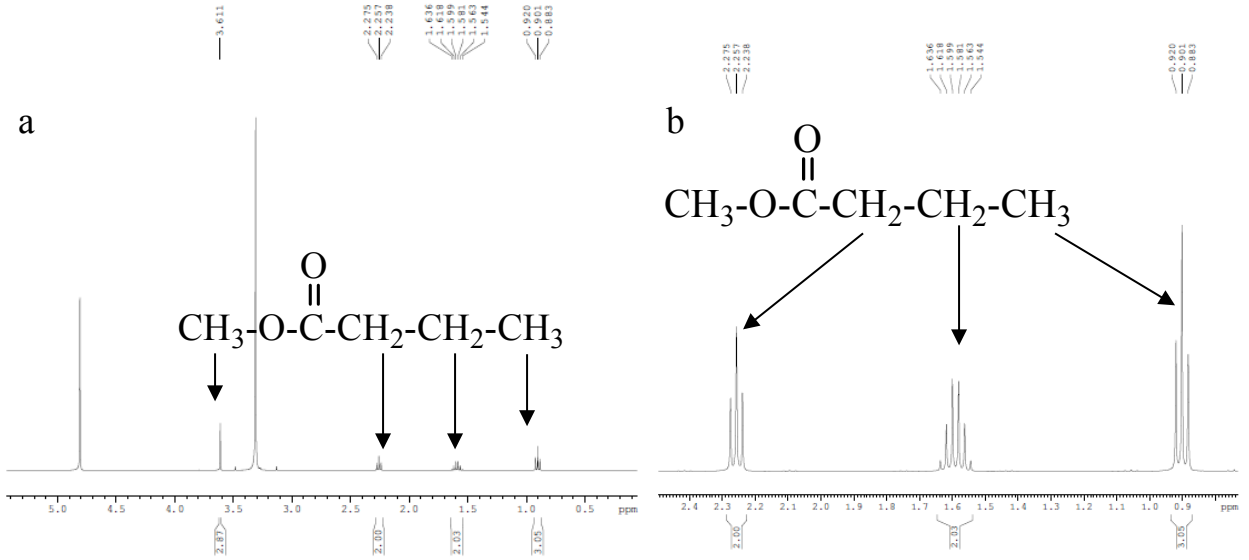

Fig. S2 ^{1}H-NMR spectra of the mixture distilled from the products of the transesterification of tributyrin with methanol at 64 ºC (a. chemical shift in range of 0-5.5 ppm, b. enlarged range from 0.8 ppm to 2.5 ppm).

3. TPD curve of the 25-KF/LaOC-773catalyst without CO_2 pre-adsorption

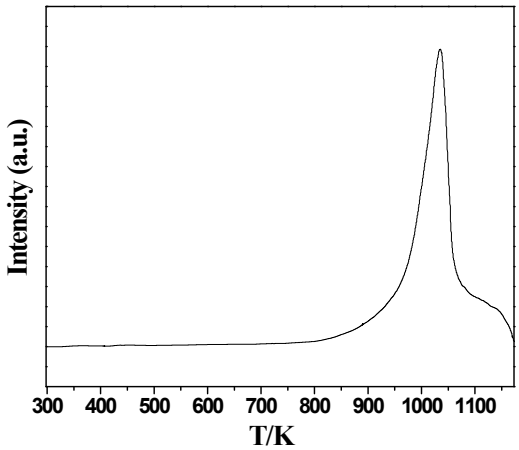

Fig. S3 TPD curve of the 25-KF/LaOC-773catalyst without CO_2 pre-adsorption (blank CO_2-TPD)

4. Catalytic activities of the fresh and the used 25-KF/LaOC-773 catalysts

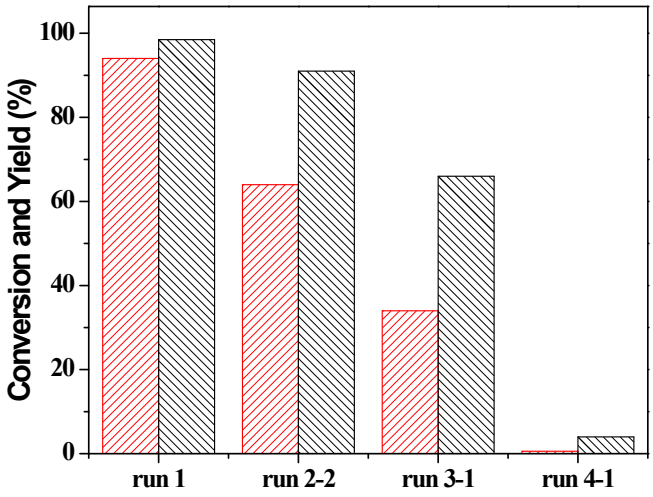

Fig. S4. Catalytic activities of the fresh and the used 25-KF/LaOC-773 catalysts at different condition. (▨ conversion of tributyrin, ▨ yield of methyl butyrate. Reaction conditions: 30 mg of KF/ $La_2O_2CO_3$ catalyst, the ratio of catalyst to tributyrin is 30 (mg/g), molar ratio of methanol to tributyrin = 30:1, reaction time for 60 min, reaction temperature at 308 K (run1: fresh catalyst) and 338 K (run 2-2: the second used catalyst, run 3-1: the third used catalyst, run 4-1: the forth used catalyst)

5. CO_2-TPD profiles of the fresh and the used 25-KF/LOC-773

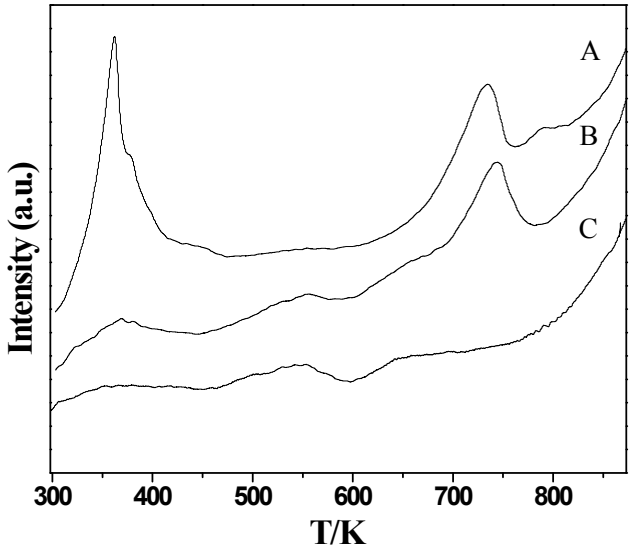

Fig. S5. CO_2-TPD profiles of the fresh and the used 25-KF/LOC-773 (A. fresh, B. the second used, C. the forth used)