

## One-step transformation of fructose to 2, 5-diformylfuran over Ru metal supported on montmorillonite

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### Table of contents

Sr. No.	Contents	Page No.
1	Figure S1. XPS spectrum: (a) Si 2p XPS spectra, (b) Al2p XPS spectra, (c) Mg1s XPS spectra and (d) C1s XPS spectra.	2
2	Figure S2. Recycling experiments for oxidation of HMF to DFF catalyst.	2
3	Figure S3. Recycling experiments for one-pot and one-step conversion of fructose into DFF.	3
4	Figure S4. XPS scans of recycled 2 wt%Ru-MMT catalyst (a) Wide scan; (b) Ru 3d3/2 XPS spectra.	3
5	Figure S5. EDX spectra of recycled 2%Ru-MMT catalyst.	4
6	Figure S6. TEM image of recycled 2%Ru-MMT catalyst.	4
7	Spectral data for 2, 5-Diformylfuran	5

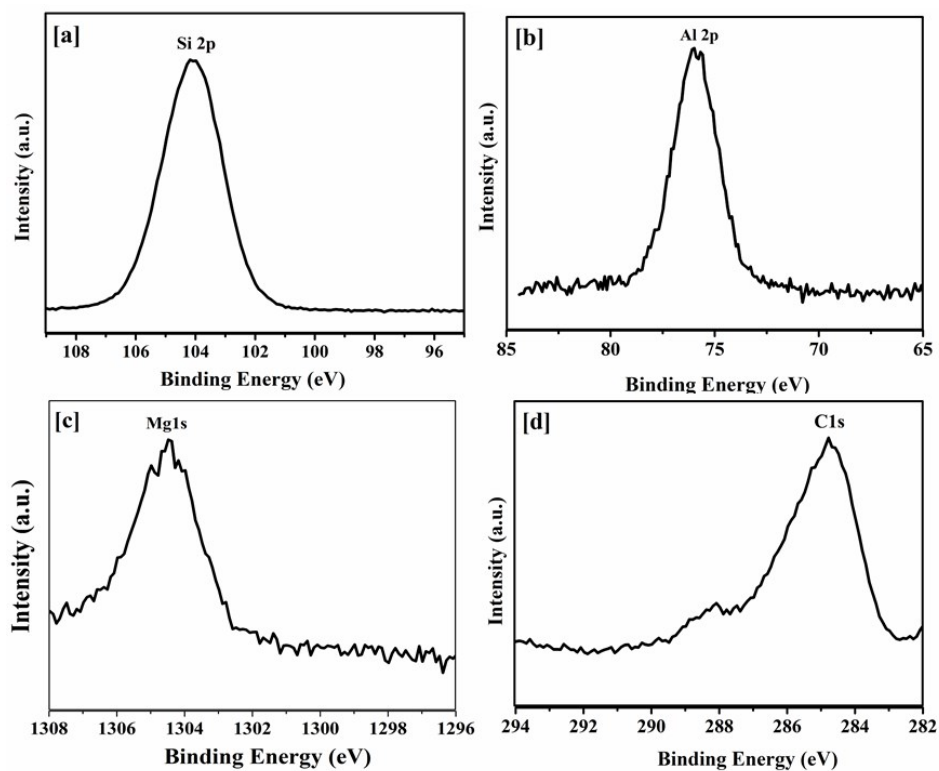


Figure S1. XPS spectrum: (a) Si 2p XPS spectra, (b) Al2p XPS spectra, (c) Mg1s XPS spectra and (d) C1s XPS spectra.

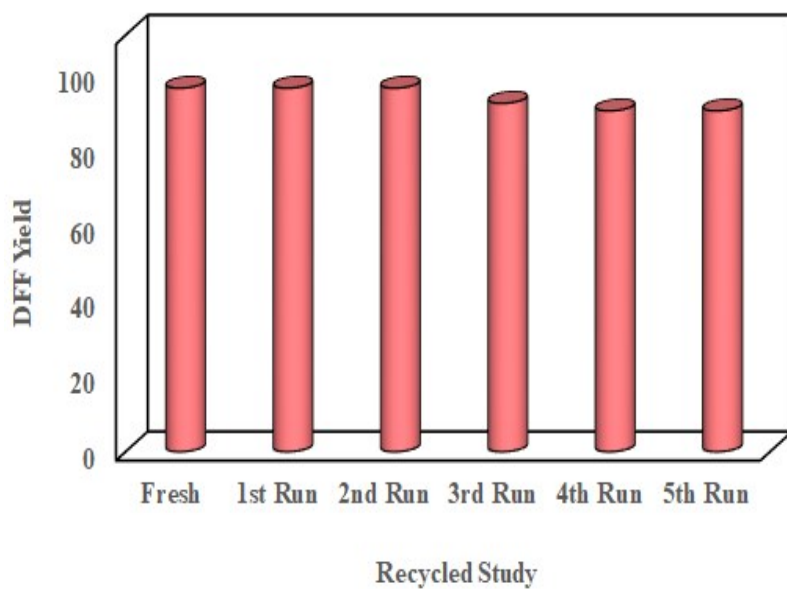


Figure S2. Recycling experiments for oxidation of HMF to DFF. Reaction conditions: HMF (63 mg, 1 mmol), catalyst (30 mg), DMSO (10 mL), at 120 °C, for 4 h and 3 bar O<sub>2</sub> pressure.

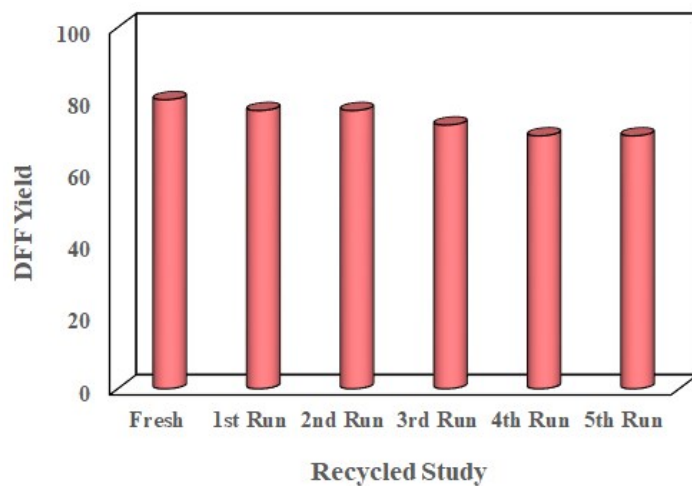


Figure S3. Recycling experiments for one-pot and one-step conversion of fructose into DFF. Reaction conditions: fructose (90 mg, 0.5 mmol), 2 wt% Ru-MMT (30 mg), DMSO (10 mL), at 120 °C. The 1<sup>st</sup> step and 2<sup>nd</sup> step performed under an O<sub>2</sub> (3 bar) atmosphere for 6 hrs.

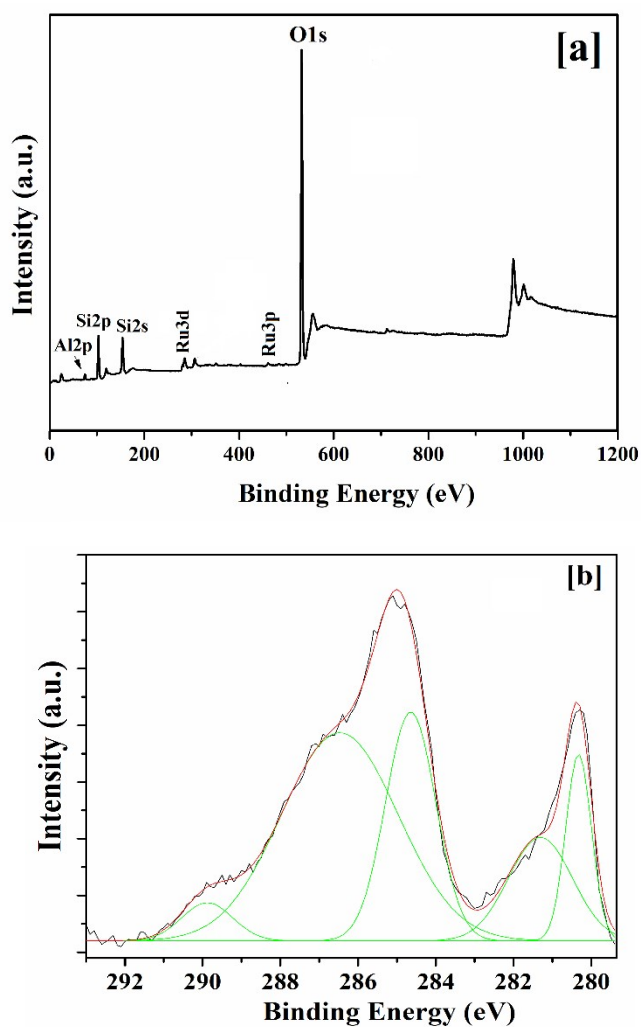


Figure S4. XPS scans of recycled 2 wt% Ru-MMT catalyst (a) Wide scan; (b) Ru 3d<sub>3/2</sub> XPS spectra.

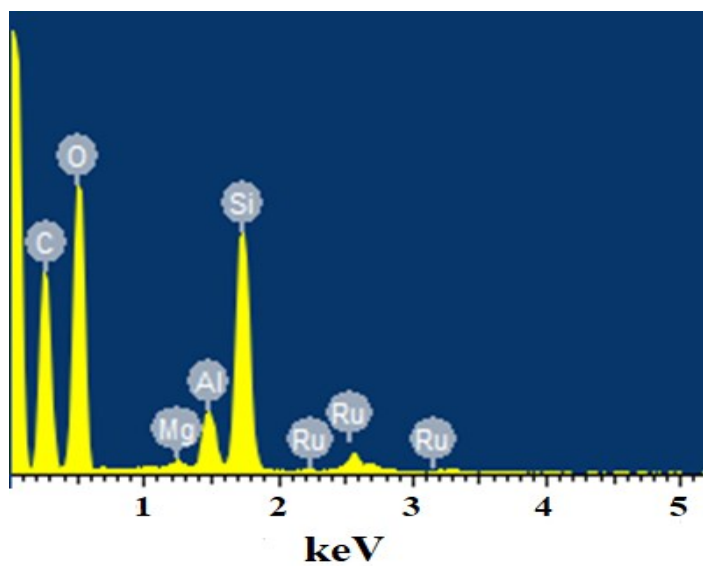


Figure S5. EDX spectra of recycled 2 wt% Ru-MMT catalyst.

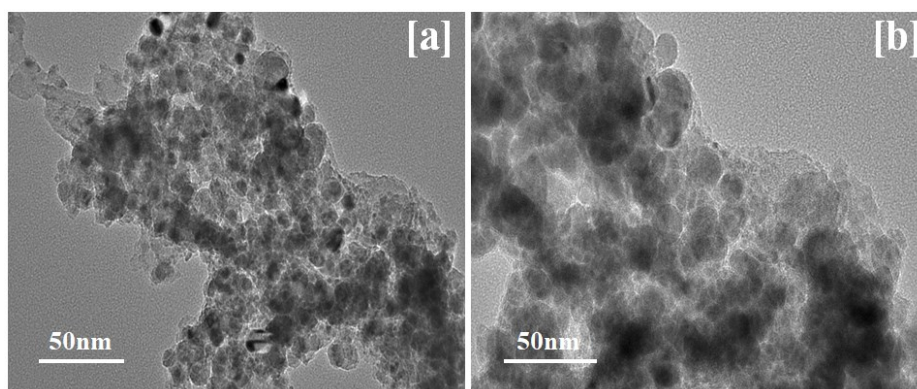
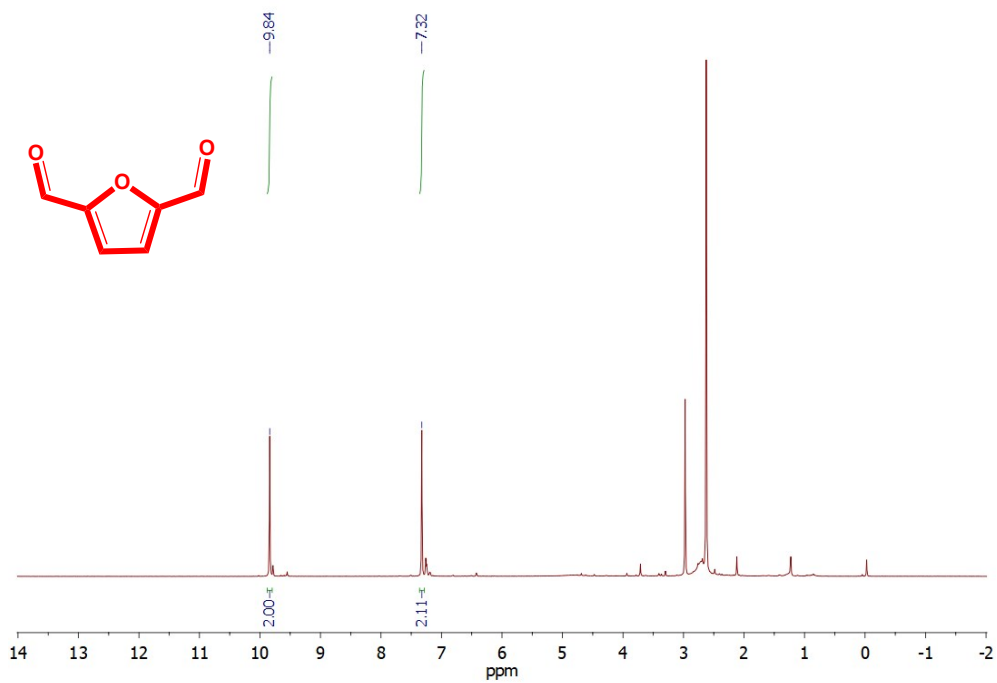


Figure S6. TEM image of recycled 2 wt% Ru-MMT catalyst.

### Spectral data for 2, 5-Diformylfuran

$^1\text{H NMR}$  (500 MHz,  $\text{CDCl}_3$ )  $\delta$  9.84 (s, 2H), 7.32 (s, 2H); GC-MS:  $m/z$  124, 95, 67, 43, 40.

### $^1\text{H NMR}$ spectral of 2, 5-Diformylfuran



$^1\text{H NMR}$  (500 MHz,  $\text{CDCl}_3$ ) spectra of crude 2, 5-Diformylfuran obtained when the reaction was carried out on fructose.

### GC-MS spectral of 2, 5-Diformylfuran

