Supporting Information

Insights into the carbon catalyzed direct dehydrogenation of isobutane by employing modified OMCs

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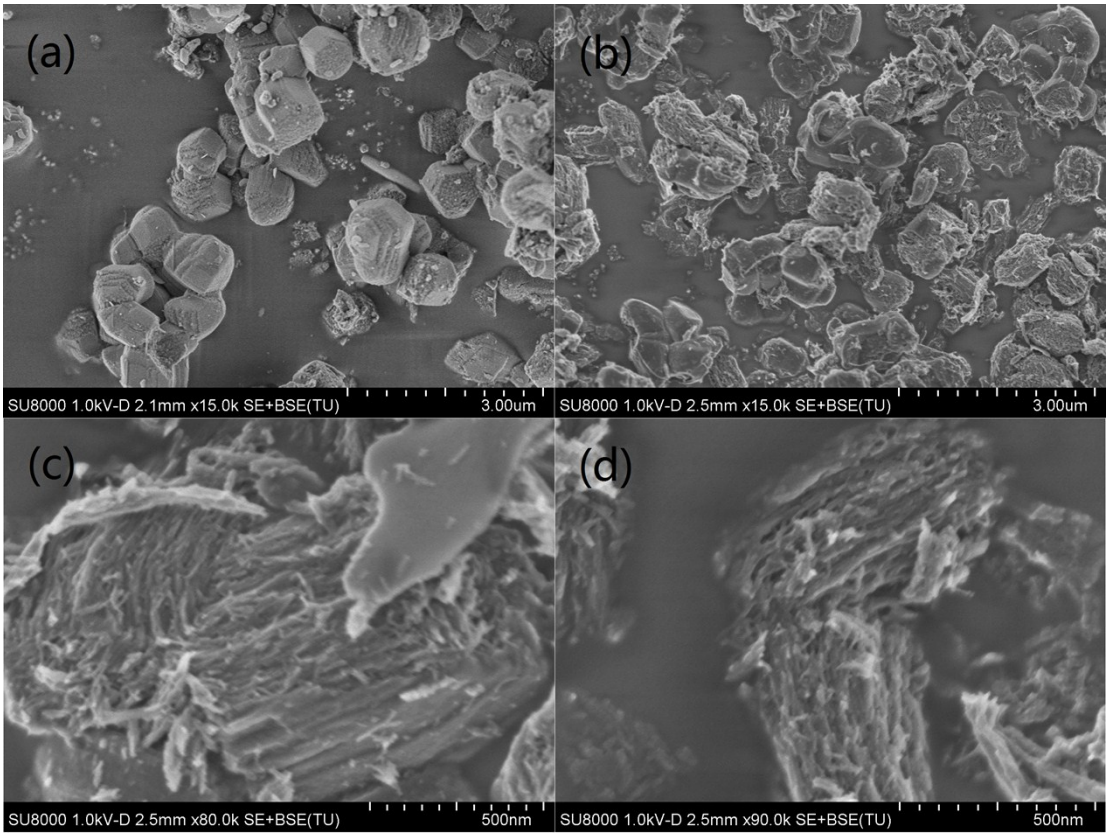

Fig. S1 FESEM images of the prepared samples: (a) SBA-15, (b) OMC8, (c) OMC-H_2 and (d) OMC-H_2O_2.

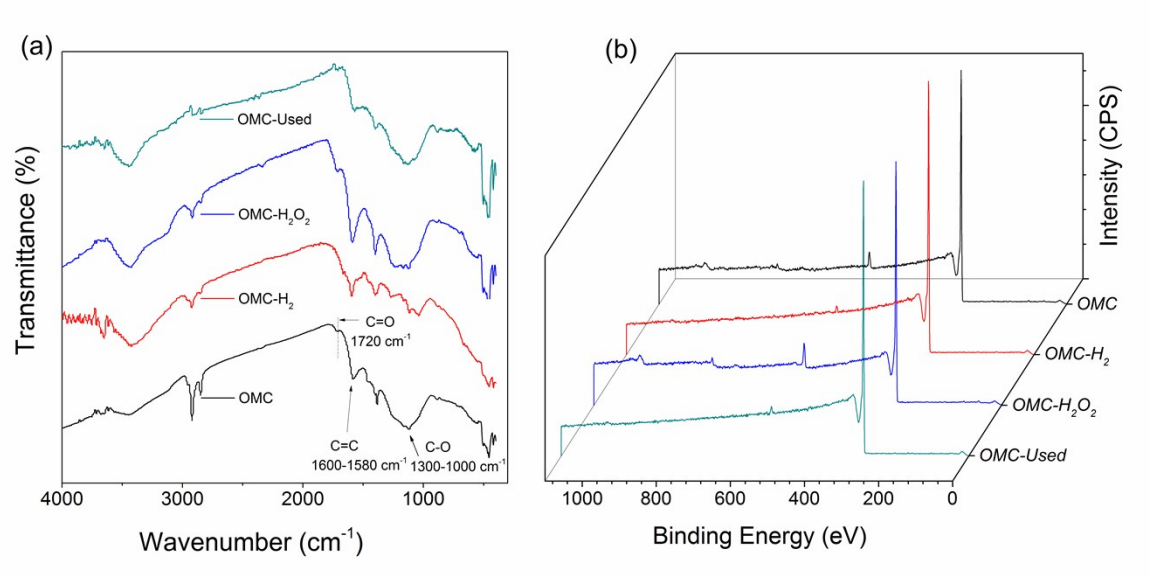

Fig. S2 (a) FTIR spectra and (b) Overview XPS spectra of the prepared samples.

The O-doping was also studied by the Fourier transform infrared (FTIR) spectroscopy. The broad band at 1300–1000 cm^{-1} was due to the C-O stretching vibrations of single-bonded oxygen in acids, alcohol, ether or esters. The small peak at 1720 cm^{-1} could be assigned to C=O stretching vibrations of ketones, aldehydes, lactones or carboxyl groups.

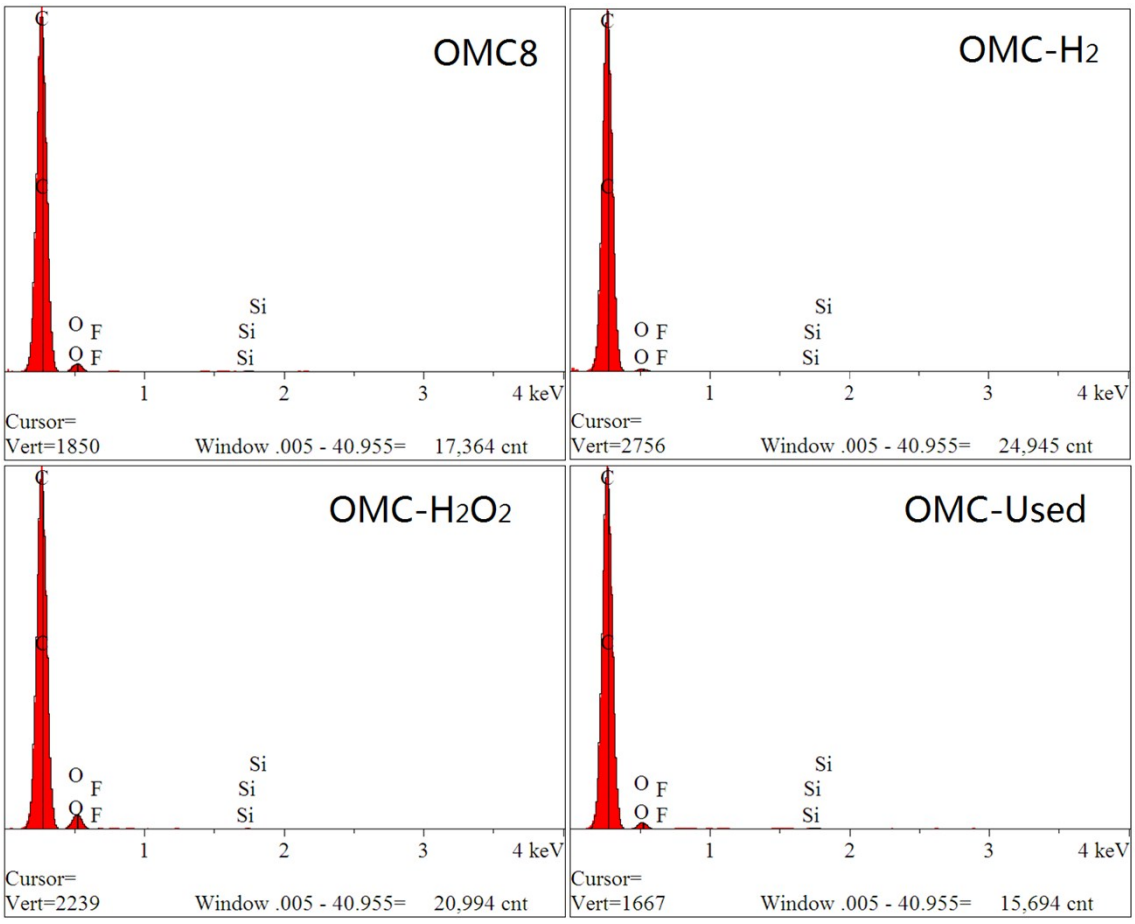

Fig. S3 Scanning electron microscope energy dispersive X-ray spectra (SEM-EDS) of samples.

Table S1 SEM-EDS elemental analysis of samples

Sample	Relative atomic concentrations (%)			
	C	O	Si	F
OMC8	90.16	9.35	0. 31	0.18
OMC-H_2	95.50	4.13	0.15	0.22
OMC-H_2O_2	89.17	10.31	0.23	0.29
OMC-Used	92.10	7.42	0.28	0.20

Table S2 The composition of output gas after DDH reaction

Sample	Relative mole concentrations (%)							
	[c] CH_4	C_2H_6	C_2H_4	C_3H_8	C_3H_6	C_4H_{10}	C_4H_8	[d] Coke
[a] OMC8	2.33%	0.10%	0.14%	1.30%	3.30%	62.68%	30.14%	2.51%
OMC-H_2	1.55%	0.05%	0.08%	0.77%	2.70%	68.90%	25.95%	2.05%
OMC-H_2O_2	3.23%	0.17%	0.22%	1.76%	4.17%	57.15%	33.30%	3.09%
[b] OMC-Used	2.03%	0.08%	0.17%	0.72%	4.01%	72.88%	20.10%	2.95%

[a] For OMC8, OMC-H_2 and OMC-H_2O_2 the data were collected at initial activity after stabilized. [b] For OMC-Used the data were collected after 4000 minutes of reaction. [c] The type of generated hydrocarbons were determined by its retention times refer to the standard spectrum diagram of corresponding chromatographic column. [c] The possible generation of these hydrocarbons were determined according to the reference. [11] [d] The amount of generated coke was not from the chromatographic data, it was an estimated value that calculated according to the conservation of carbon elements, assuming that at each step of cracking (C_4-C_3-C_2,) one carbon atom would be released, if it was not CH_4, it should be the coke. The content of hydrocarbons were calculated by mole ratio.