

Electronic Supplementary Information

A cascade deoxygenation process integrating acid and base catalysts for the efficient production of second-generation biofuels

Héctor Hernando,^{a,b} Begoña Puértolas,^c Patricia Pizarro,^{a,b} Javier Fermoso,^a Javier Pérez-Ramírez,^c David P. Serrano,^{a,b}*

^a Thermochemical Processes Unit, IMDEA Energy Institute, 28935, Móstoles, Madrid, Spain.

^b Chemical and Environmental Engineering Group, ESCET, Rey Juan Carlos University, 28933, Móstoles, Madrid, Spain.

^c Institute for Chemical and Bioengineering, Department of Chemistry and Applied Biosciences, ETH Zurich, Vladimir-Prelog-Weg 1, 8093, Zurich, Switzerland.

* Corresponding author: David P. Serrano; Tel: +34 91 737114
E-mail: david.serrano@imdea.org

No. of Pages: 4

No. of Figures: 3

No. of Tables: 2

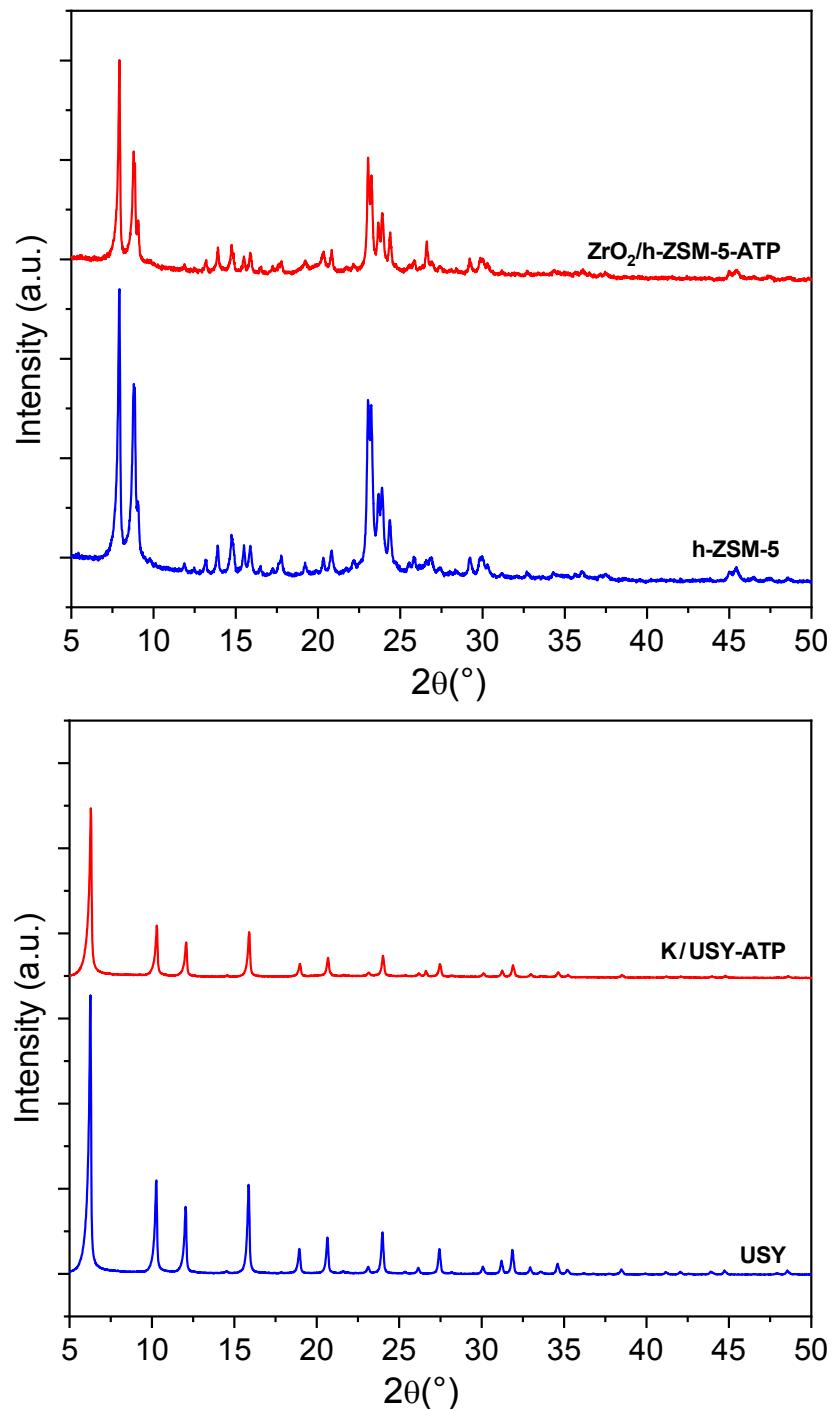


Figure S1. X-ray diffractograms of parent zeolites and derived technical catalysts.

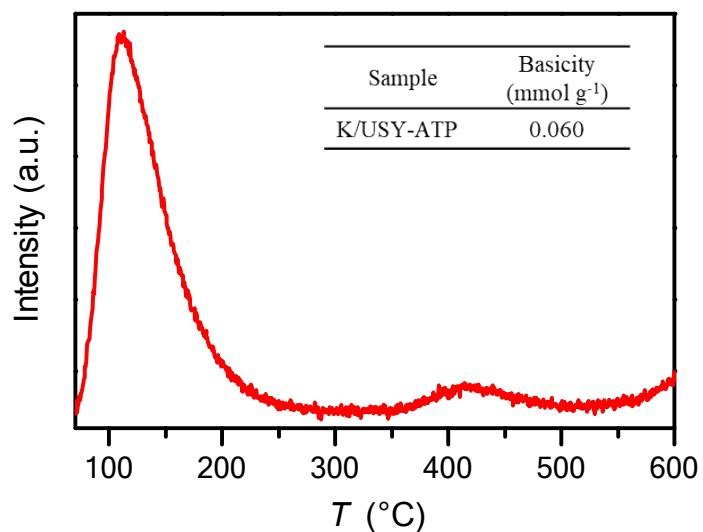


Figure S2. CO₂-TPD profile of the K/USY-ATP zeolite.

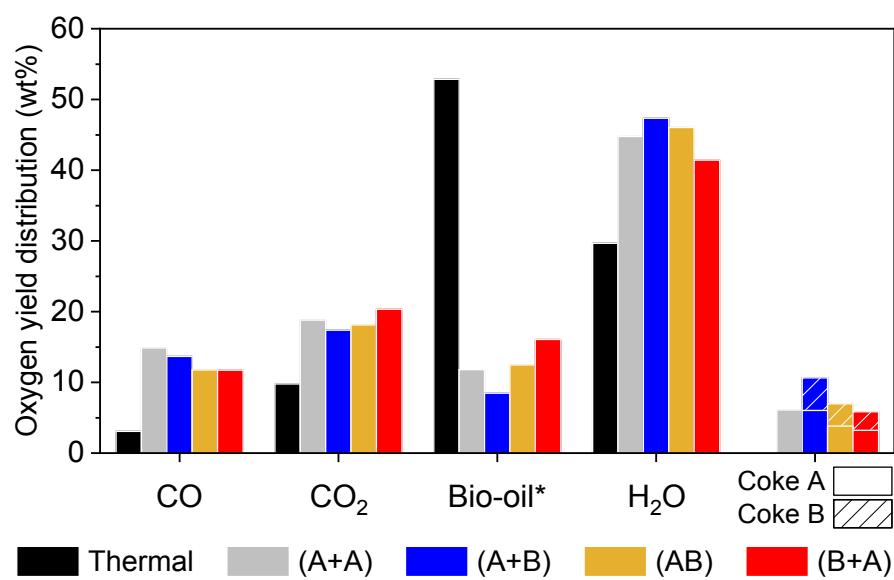


Figure S3. Oxygen yield distribution by products in the thermal and catalytic pyrolysis of WS-ac under different catalysts coupling configurations.

Table S1. Mass yield of gaseous hydrocarbons obtained in the catalytic pyrolysis of WS-ac under different catalysts coupling configurations

Sample	GP (wt%·10 ⁻²)				GO (wt%·10 ⁻²)		
	CH ₄	C ₂ H ₆	C ₃ H ₈	C ₄ H ₁₀	C ₂ H ₄	C ₃ H ₆	C ₄ H ₈
Thermal	34.7	8.0	2.4	0.5	5.8	4.8	1.2
(A+A)	57.3	18.6	10.4	10.4	70.3	107.3	18.6
(A+B)	52.3	12.6	9.7	10.7	58.4	95.6	18.0
(AB)	57.1	15.6	9.2	9.3	46.9	80.7	16.7
(B+A)	64.1	18.5	8.3	3.2	33.1	50.9	9.2

Table S2. Mass and energy yields and elemental composition of the coke deposited over ZrO₂/h-ZSM-5-ATP (A) and K/USY-ATP (B) during the catalytic pyrolysis of WS-ac under different catalysts coupling configurations

Catalyst	Coke	Mass yield (wt%)	Ultimate analysis (wt%)				Energy yield (%)
			C	H	N	O	
(A+A)	Overall	10.2	62.2	9.8	2.1	25.9	16.4
	Coke A	7.3	56.5	6.4	1.2	35.9	9.0
(A+B)	Coke B	5.4	55.4	6.0	1.5	37.2	6.4
	Overall	12.7	56.0	6.2	1.3	36.5	15.4
(AB)	Coke A	5.9	61.5	9.0	0.5	29.0	9.0
	Coke B	5.6	68.7	6.4	0.2	24.8	8.5
(B+A)	Overall	11.5	65.0	7.7	0.4	27.0	17.5
	Coke A	5.9	64.5	11.1	0.1	24.2	10.3
	Coke B	5.8	73.8	5.9	0.1	20.2	9.3
	Overall	11.7	69.1	8.5	0.1	22.2	19.6