

1 Article

2 **Resolving the acid site distribution in Zn-exchanged**
 3 **ZSM-5 with stimulated Raman scattering microscopy**

4 —

5 **Supporting information**

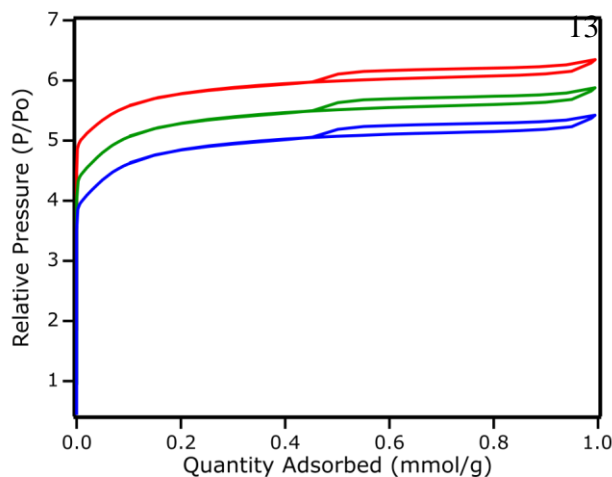
6 **Guillaume Fleury**¹, **Maarten B.J. Roeffaers**^{1,*}

7 ¹ Department of Microbial and Molecular Systems, Centre for Membrane Separations, Adsorption, Catalysis
 8 and Spectroscopy for Sustainable Solutions (cMACS), KULeuven, Celestijnenlaan 200F, 3001 Leuven,
 9 Belgium

10 * Correspondence: maarten.roeffaers@kuleuven.be; Tel.: +32-16327449

11

12



14

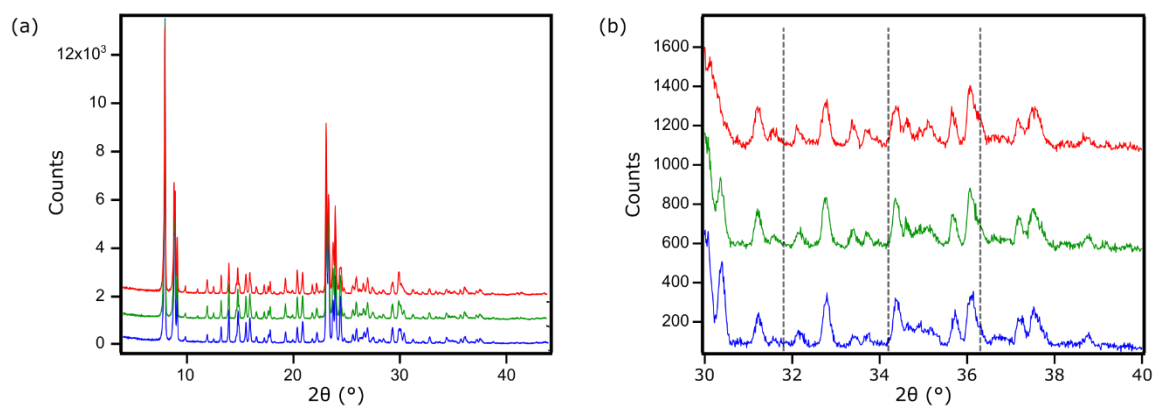
15 **Figure S1.** Nitrogen adsorption and desorption isotherms of the protonated and zinc-exchanged
 16 ZSM-5 zeolites (blue: Zn000, green: Zn030, red: Zn600). The curves are offset for clarity.

17

18 **Table S1.** Textural properties of the protonated and zinc-exchanged ZSM-5 zeolites determined from
 19 nitrogen physisorption measurements.

	S_{BET} (m^2g^{-1})	V_{micro} (cm^3g^{-1})	V_{meso} (cm^3g^{-1})
Zn000	359	0.132	0.038
Zn030	351	0.13	0.038
Zn600	323	0.119	0.036

20



21

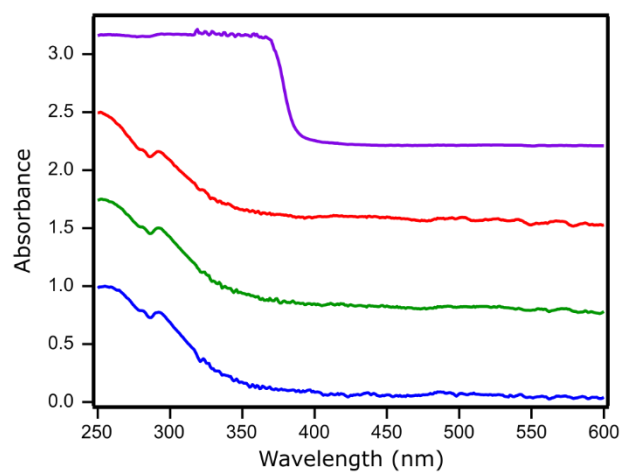
22

23

24

Figure S2. XRD patterns of the protonated and zinc-exchanged ZSM-5 zeolites (a) at 2θ of 5–45° and (b) scaled up from 2θ of 30 to 40° (blue: Zn000, green: Zn030, red: Zn600). The position of the (100), (200), and (101) reflections of ZnO ($2\theta = 31.6^\circ, 34.2^\circ, 36.1^\circ$) are highlighted.

25

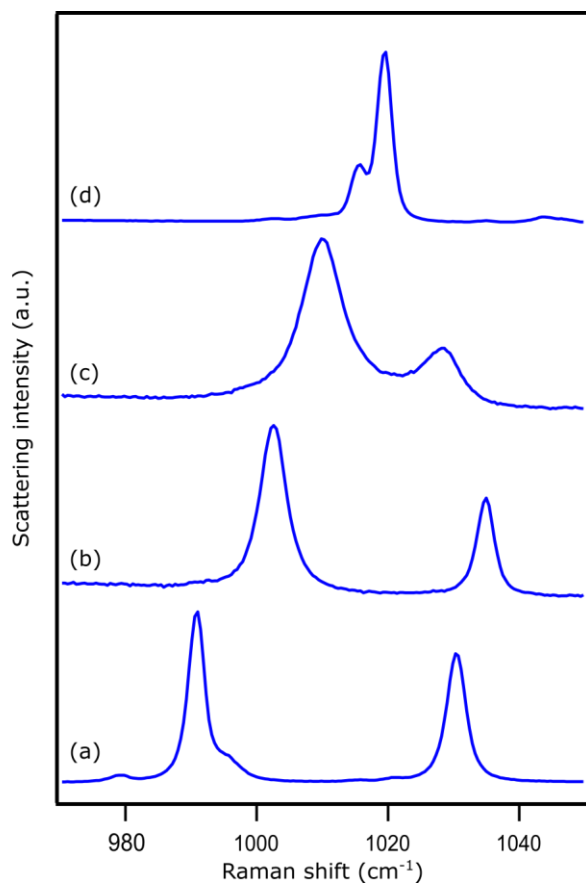


26

27

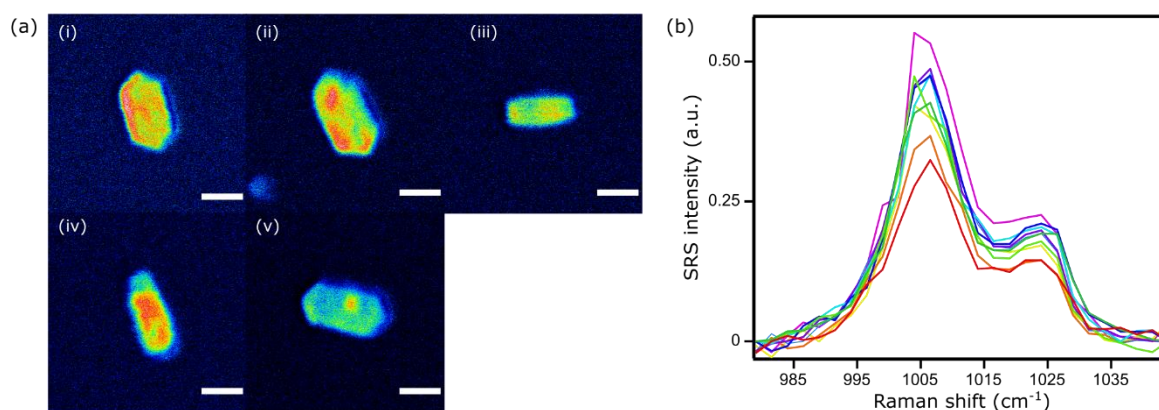
28

Figure S3. UV-visible diffuse reflectance spectra of the protonated and zinc-exchanged ZSM-5 zeolites as well as nanoparticles of ZnO (blue: Zn000, green: Zn030, red: Zn600, purple: ZnO nanoparticles).



29

30 **Figure S4.** Spontaneous Raman spectra of pyridine in different environments: (a) pure liquid, (b)
 31 aqueous solution (0.1M), (c) aqueous solution (0.1M) containing HCl (0.11 M), and (d) solid formed
 32 in an aqueous solution (0.1 M) containing ZnCl₂ (0.11 M).



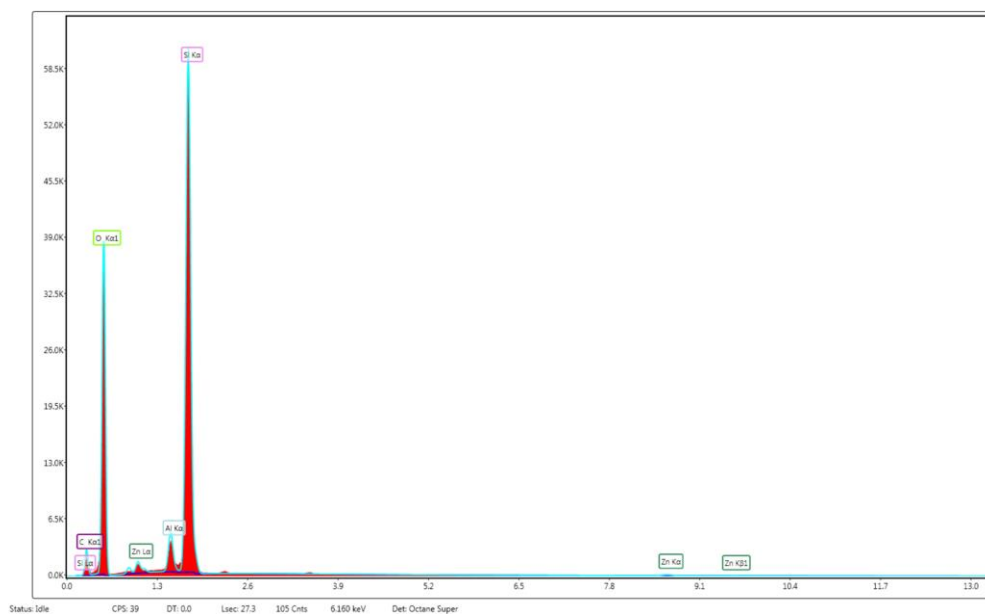
33

34 **Figure S5.** (a) SRS images of chemisorbed pyridine in Zn000 crystals after desorption at 150°C under
 35 vacuum at 1006 cm⁻¹. (b) SRS spectra of single Zn000 crystals presented in the main text and the
 36 supporting information

37 **Table S2.** Statistical analysis of the intensity ratio of the SRS signal at 1006 and 1023 cm⁻¹, I_{1023}/I_{1006} , for
 38 the 10 Zn000 crystals imaged.

	Mean	Std dev	Min	Max
Zn000	0.42	0.02	0.39	0.45

39



40

41

Figure S6. Typical EDX spectrum of a Zn600 crystal acquired by point-analysis

42

43

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

44



© 2020 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

45