

SUPPLEMENTARY INFORMATION

Discerning the Location and Nature of Coke Deposition from Surface to Bulk of Spent Zeolite Catalysts

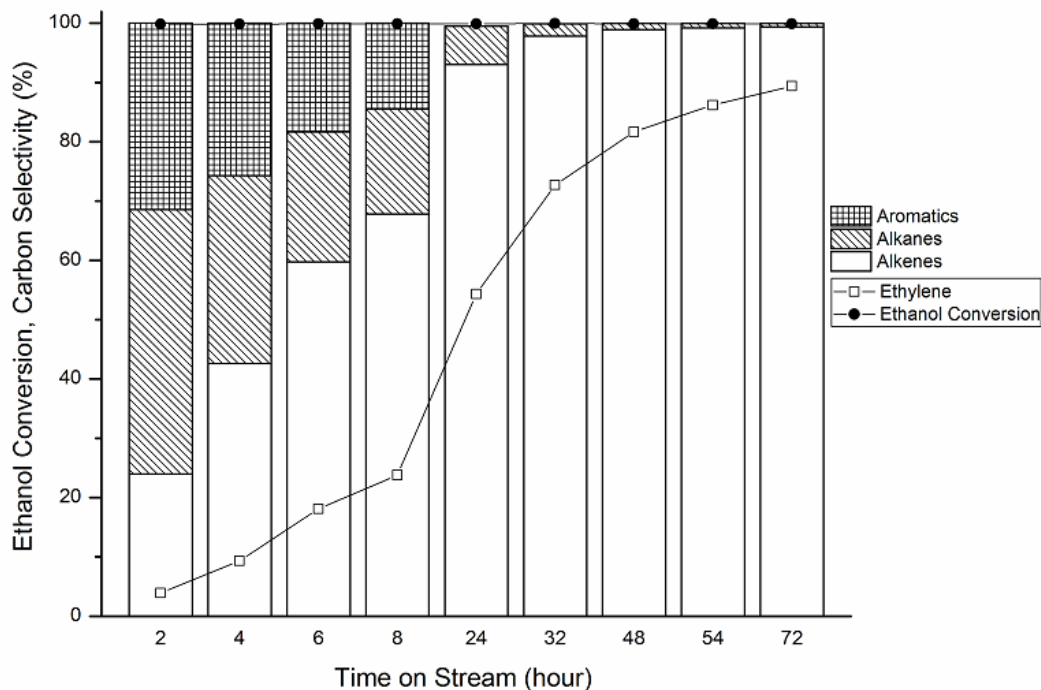
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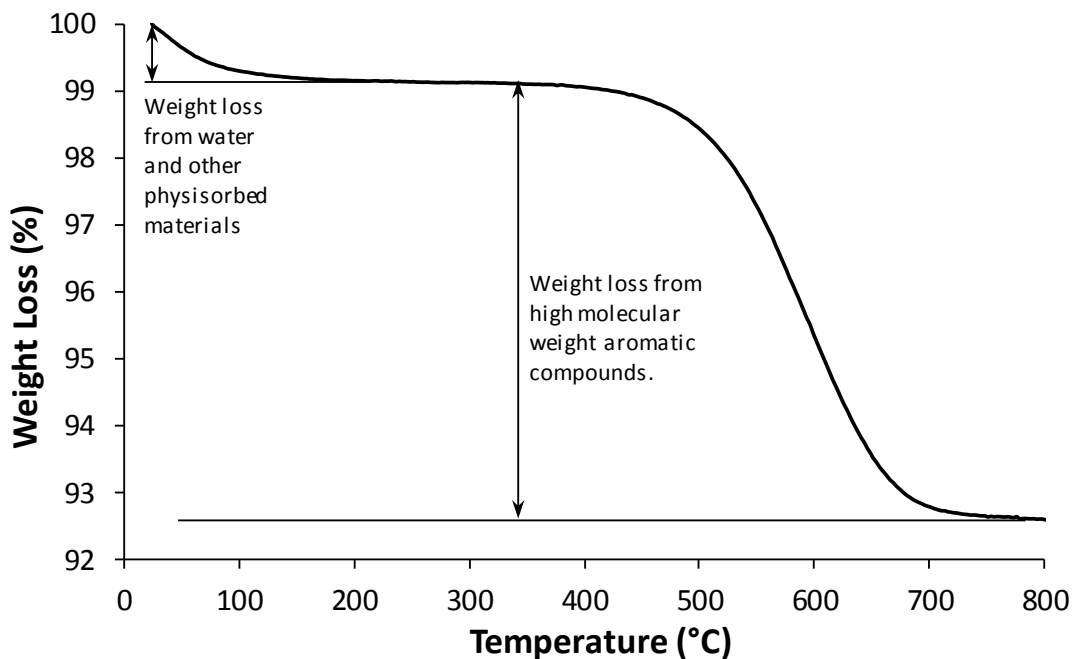
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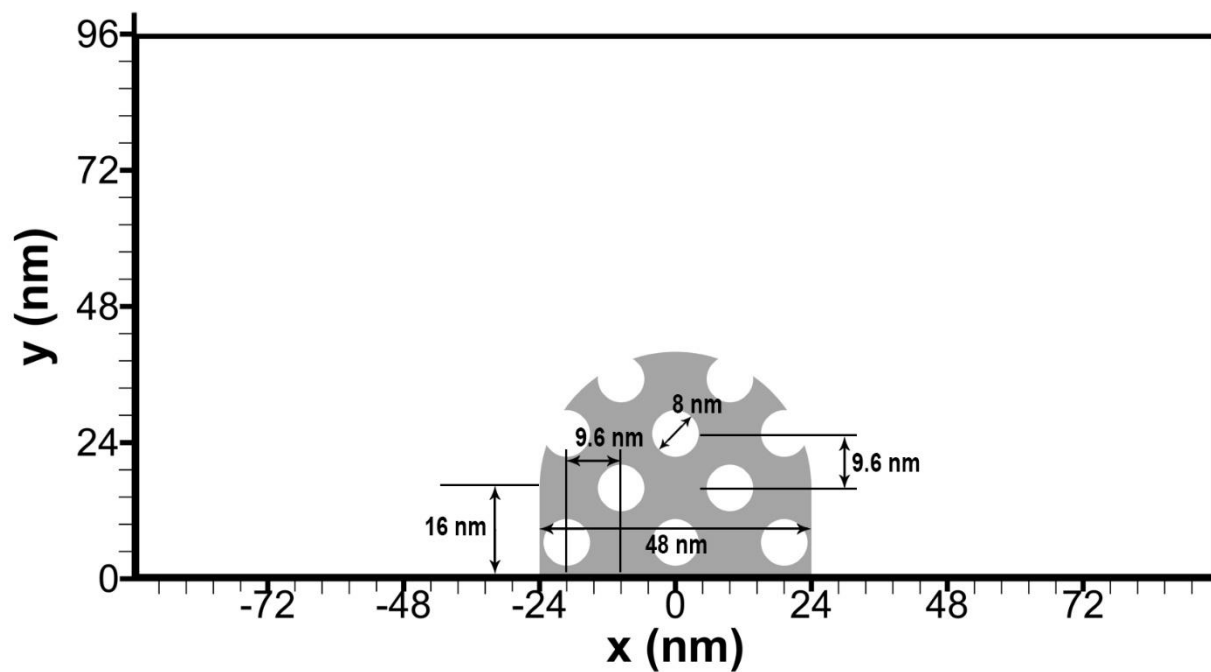
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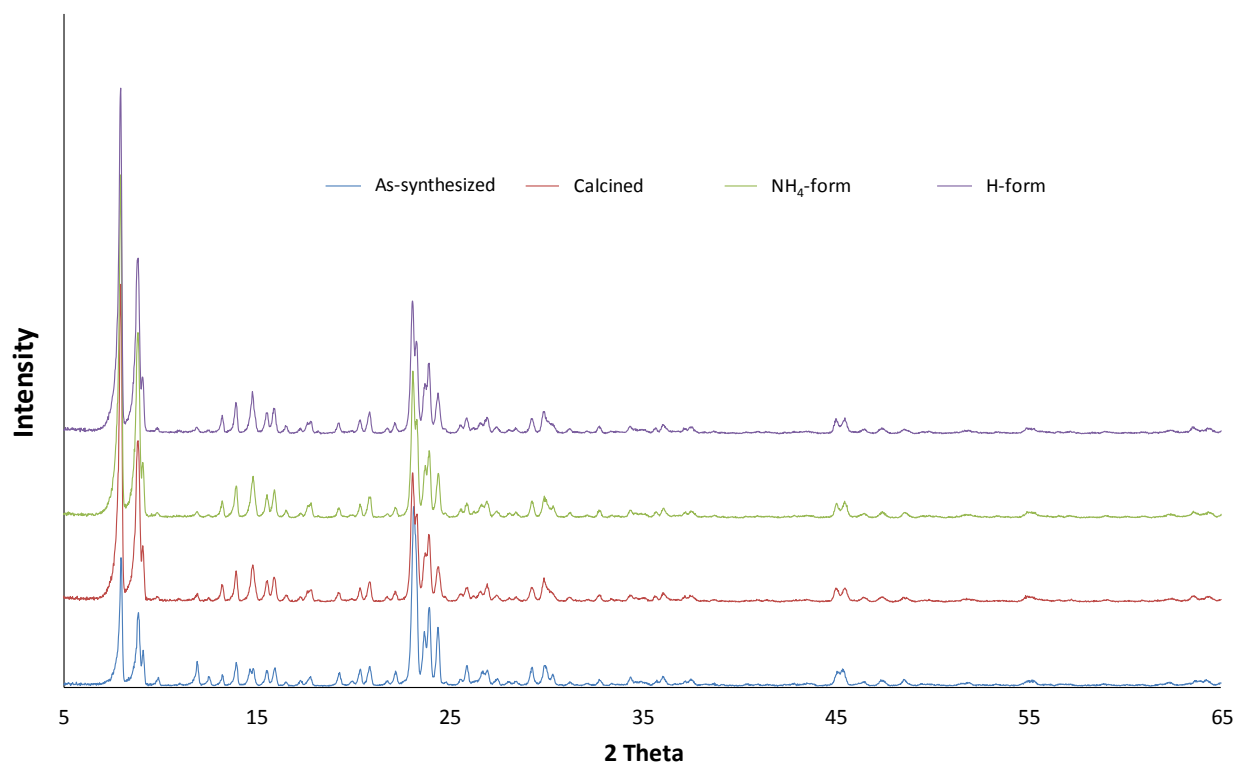
Supplementary Figure 1: Ethanol conversion and the product carbon selectivity over the HZSM-5 catalyst at 350°C, atmospheric pressure and 2.9h⁻¹ weight hourly space velocity.



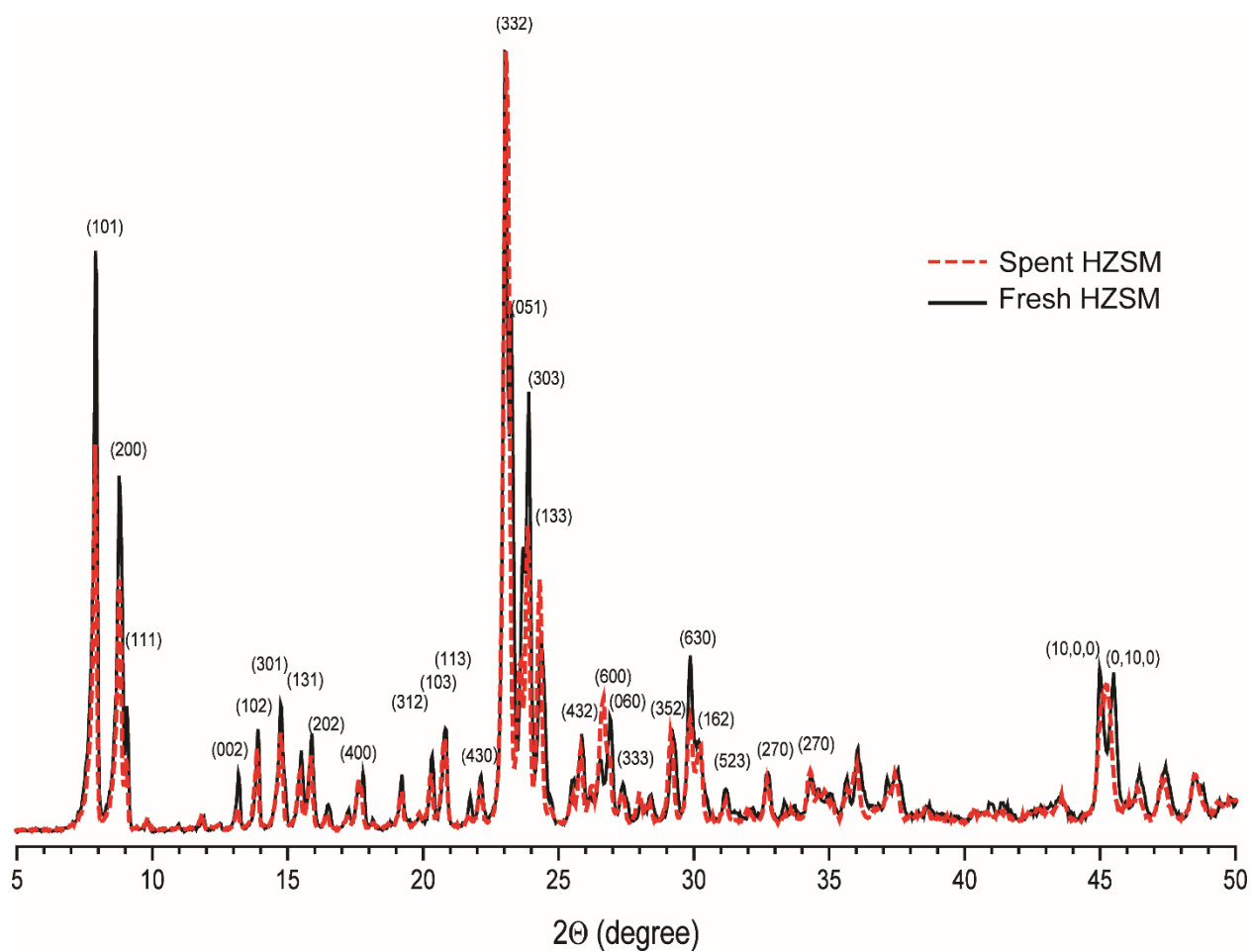
Supplementary Figure 2: Spent catalyst weight loss from the TPO-TGA using 5vol% O₂ in N₂ carrier gas with 5°C/min ramp rate to 800°C from room temperature.



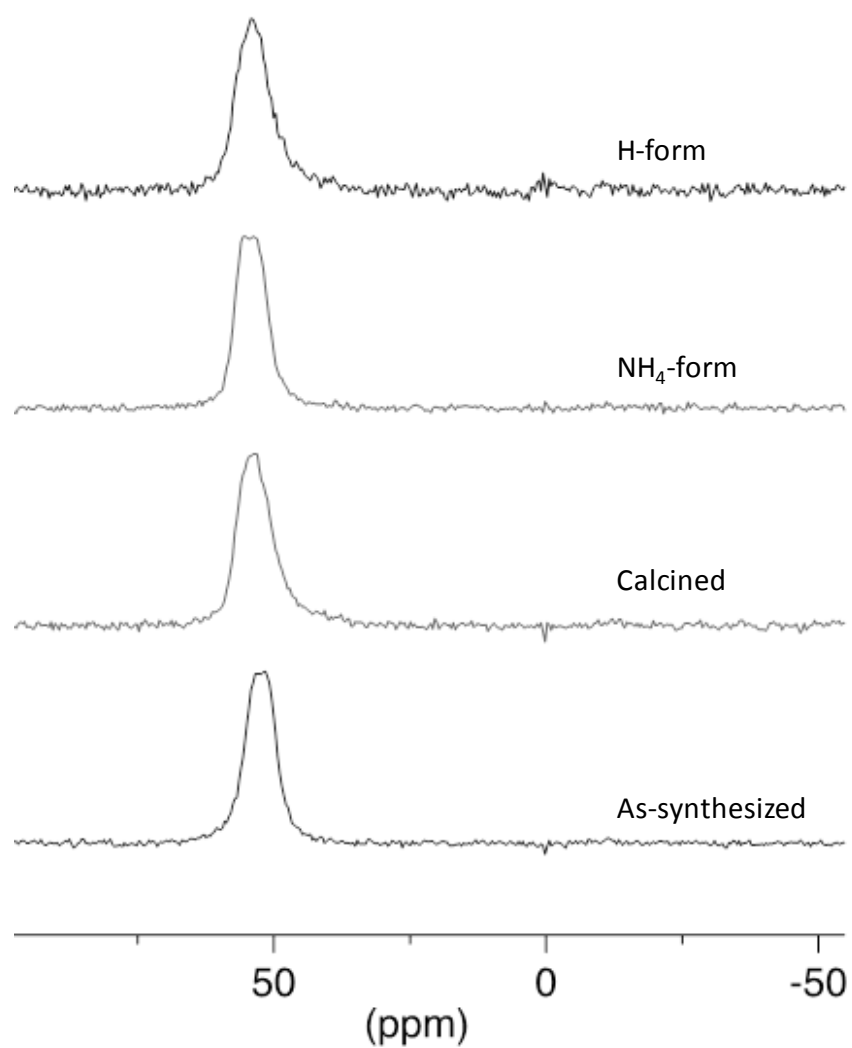
Supplementary Figure 3: The APT simulation domain and the specimen setup.



Supplementary Figure 4: XRD profile of the zeolite material tested in the form of as-synthesized, calcined, NH₄ form, and H-form.



Supplementary figure 5: XRD spectra of fresh and spent HZSM-5 showing that crystallinity of the ZSM-5 did not change due to coking.



Supplementary Figure 6: ^{27}Al MAS NMR spectra of the zeolite material tested in the form of as-synthesized, calcined, NH₄ form, and H-form.