Hierarchical Nano Zeolite-Y Hydrocracking Composite Fibers with Highly Efficient Hydrocracking Capability.

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Supplementary Information

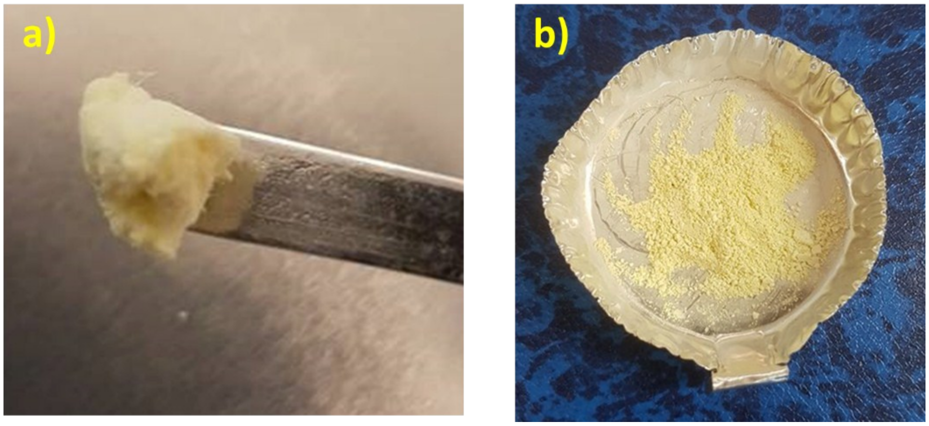


Figure S1: Physical appearance of calcined (a) HDC MF and (b) HDC NP

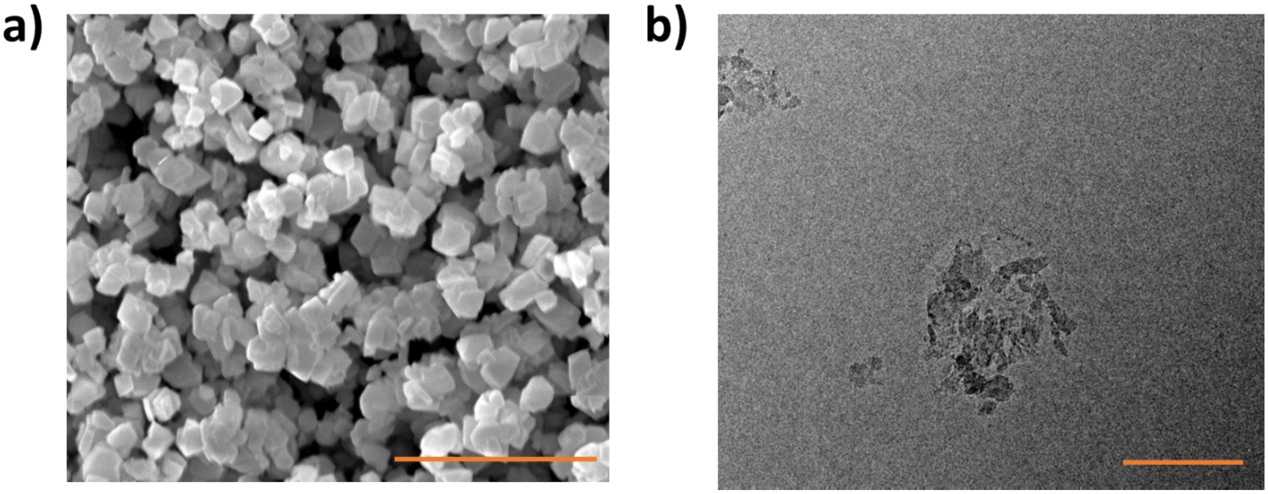


Figure S2: (a) SEM image of as received micro-Y particles having a particle range of about 500nm to 1μm in size (scale bar= 5 microns) (b) TEM image of ball milled nano-Y having particle sizes in the range of 50-150nm (scale bar= 200nm)

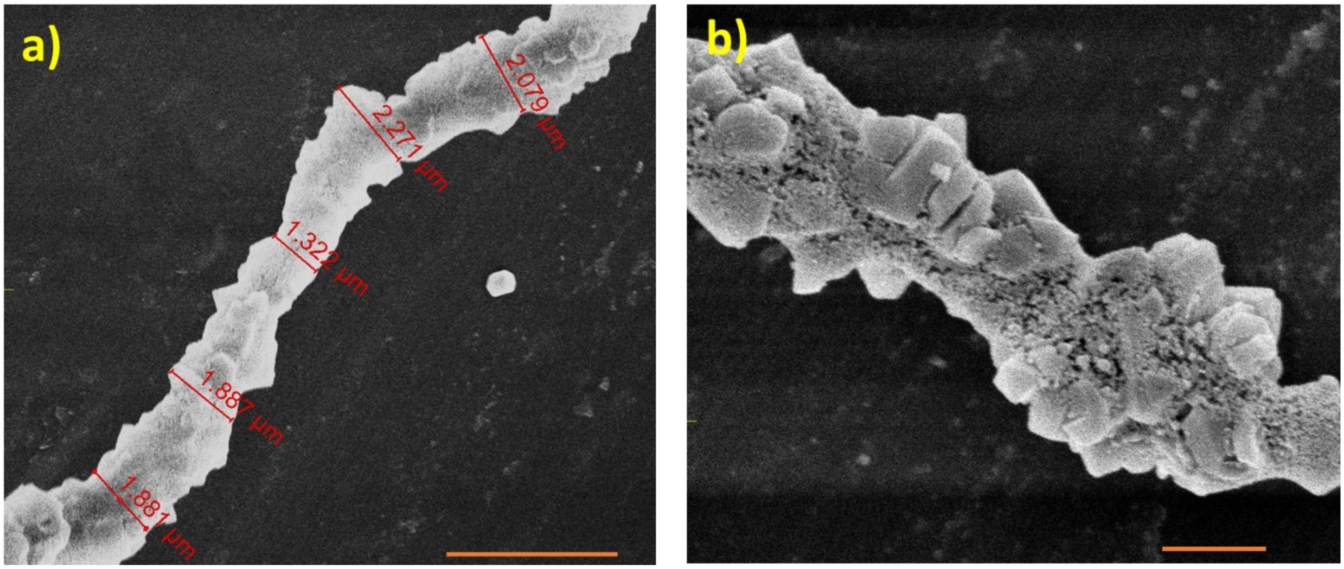


Figure S3: SEM images of a HDC MF (a) showing diameter variation within a single fiber (scale bar of 4µm) (b) a magnified image showing the surface of the fiber (Scale bar of 1µm).

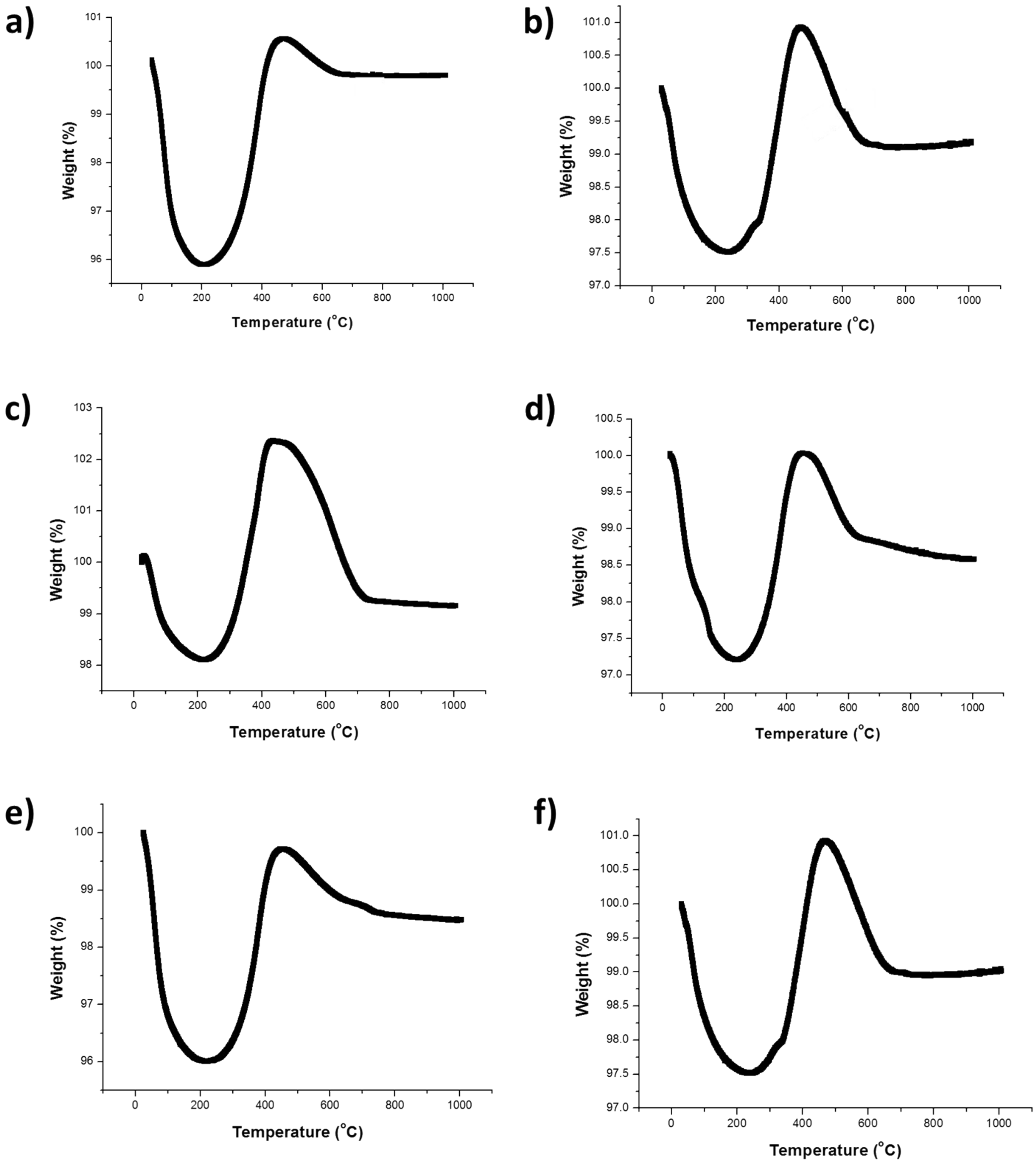


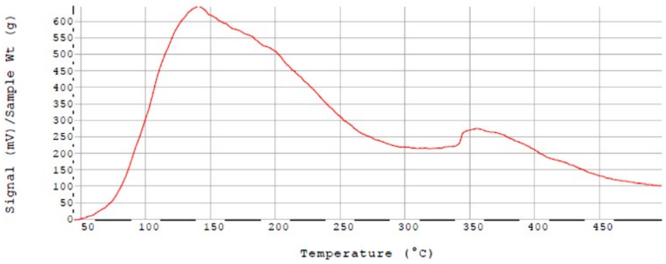
Figure S4: TGA graphs of spent catalysts (a) HDC NF at 350^{0}C (b) HDC NF at 400^{0}C (c) HDC NP at 350^{0}C (d) HDC NP at 400^{0}C (e) HDC MF at 350^{0}C (f) HDC MF at 400^{0}C

The performance of the catalysts is clearly evident from the total conversions and product selectivity obtained. High conversions of HDC NF and HDC NP show that the catalyst is active for hydrocracking. We characterized two catalysts, nano zeolite Y and HDC NF for acidity measurements. The acidity measured for HDC NF can said to be representative for HDC NP as well as the preparation procedure of salt impregnation onto zeolite was similar for both all the hydrocracking catalysts fabricated. The table lists the acidity measurements obtained from ammonia TPD:

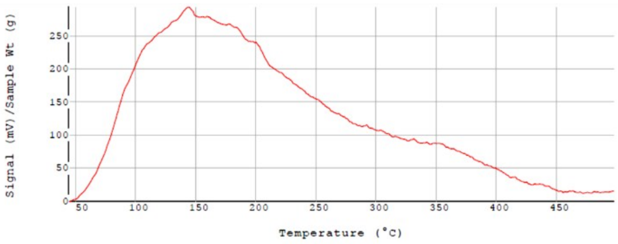
Table S1: NH_3-TPD acidity measurements

Material	Total Acidity (µmol/g)	Strong Acidity (µmol/g)
Nano zeolite Y	1549.505	292
HDC NF	598.172	115

The decrease in acidity on incorporation of metal oxide is most probably due to the exchange of H^+ by Ni ions in the zeolite framework. Nevertheless, the acidity for HDC NF is higher than the ones reported in literature for hydrocracking catalysts such as in [1], [2]. Therefore, enough acid sites were present to crack the feed molecule as also evident from the performance of the catalyst with n-heptane cracking to n-hexane and other compounds.



Nano zeolite Y



HDC NF

FigureS5: NH3-TPD profiles of Nano zeolite Y and HDC NF.

[1] J. Francis, E. Guillon, N. Bats, C. Pichon, A. Corma, L. Simon, Design of improved hydrocracking catalysts by increasing the proximity between acid and metallic sites, Applied Catalysis A: General, 409 (2011) 140-147.
[2] Y. Rezgui, M. Guemini, Effect of acidity and metal content on the activity and product selectivity for n-decane hydroisomerization and hydrocracking over nickel–tungsten supported on silica–alumina catalysts, Applied Catalysis A: General, 282 (2005) 45-53.