Electronic Supplementary Material (ESI) for Catalysis Science & Technology

Supporting Information

Shape-Controlled Synthesis of Pt nanostructures and Evaluation of Catalytic and Electrocatalytic Performance

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Figure S1

TEM image of spherical Pt nanoparticles (A) and the corresponding histogram (B).

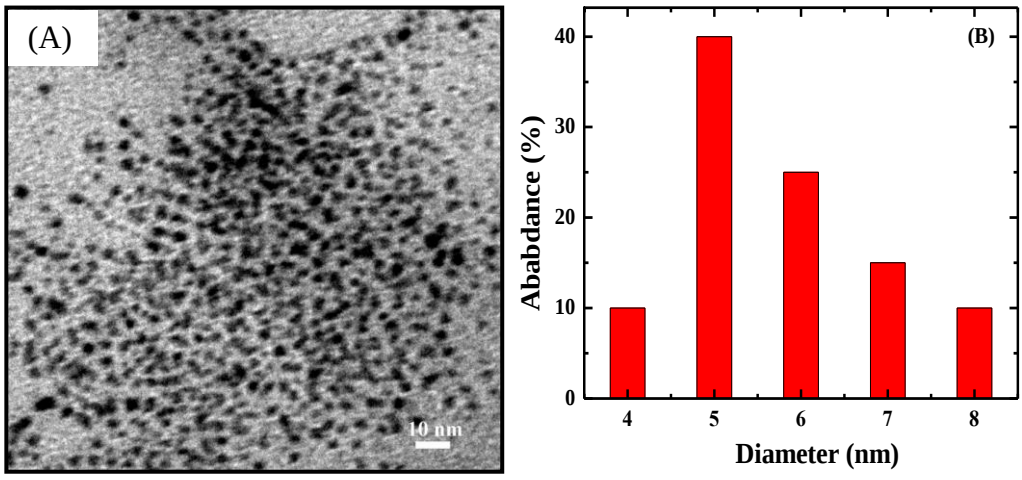


Figure S2

Magnified TEM images of peanut-like Pt nanostructures

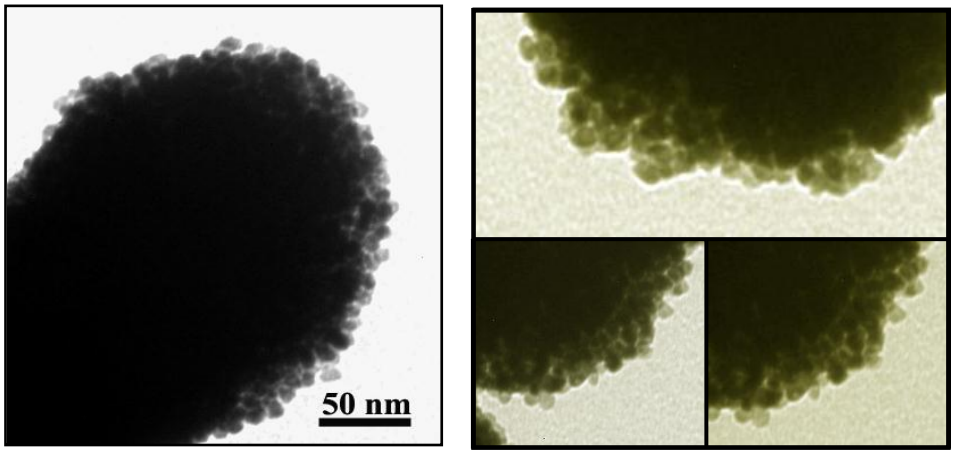


Figure S3

TEM image for the nanoparticles obtained at an intermediate stage (30 min) during the synthesis of dendritic Pt nanostructures.

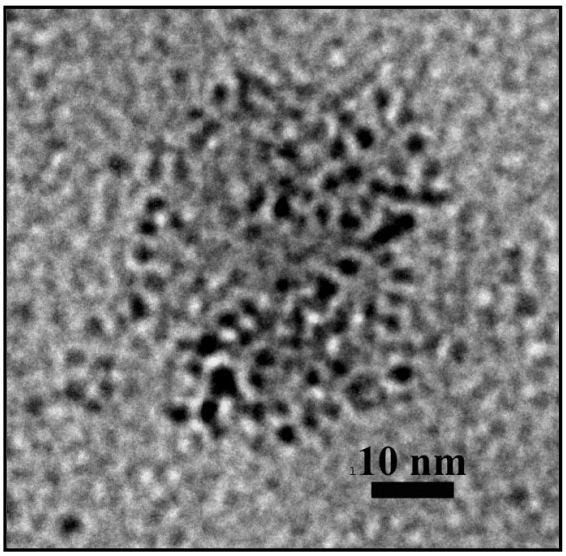


Figure S4

TEM images of MCNT-supported (A) dendritic and (B, C) peanut-like nanoparticles.

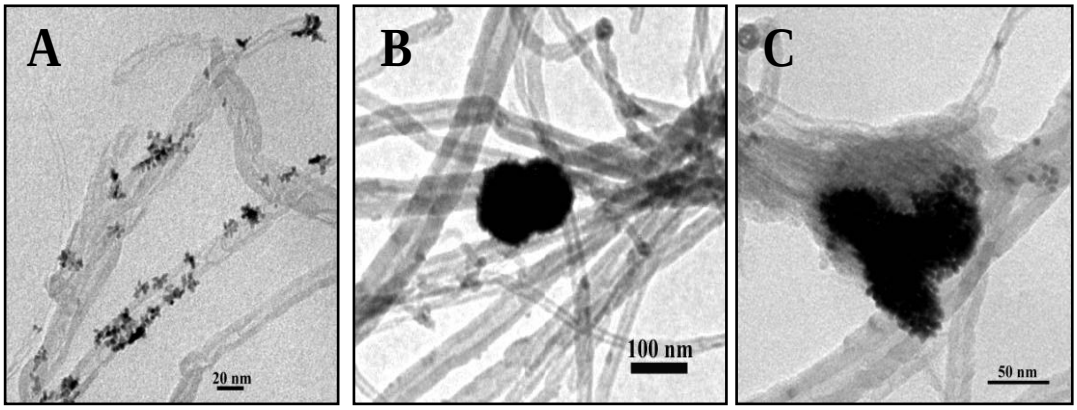


Figure S5

Voltammetric profile obtained for (a) dendritic and (b) peanut-like Pt nanoparticle modified electrodes in 0.5 M H_2SO_4. Scan rate: 100 mV/s.

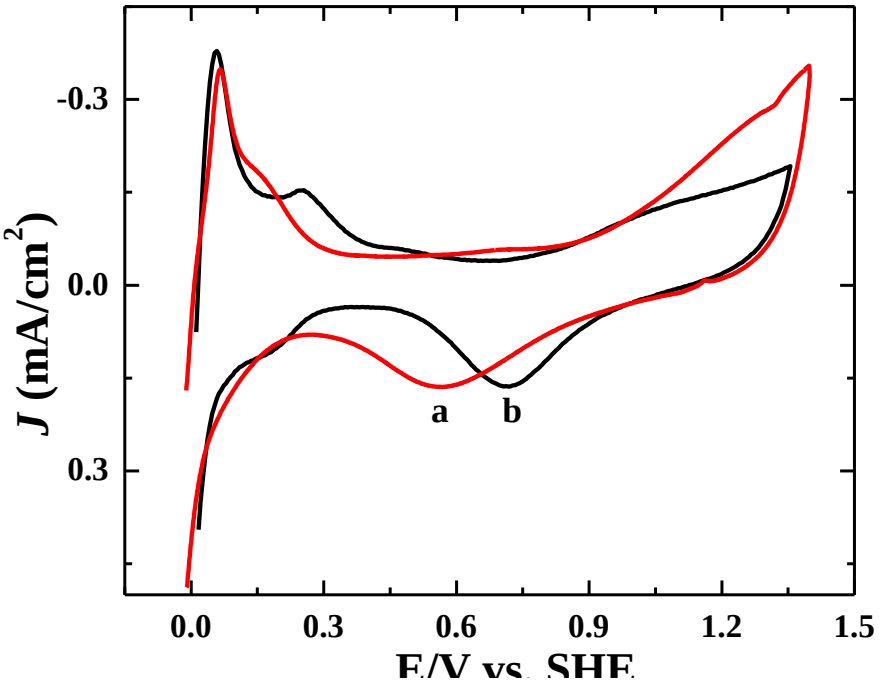


Figure S6

Plot illustrating the catalytic activity of (a) peanut-like, (b) dendritic and (c) spherical nanoparticles towards hydrogenation of unsaturated alcohols

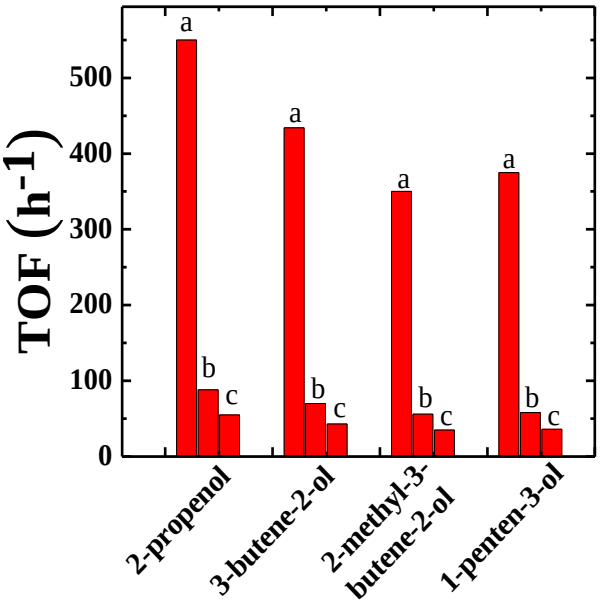
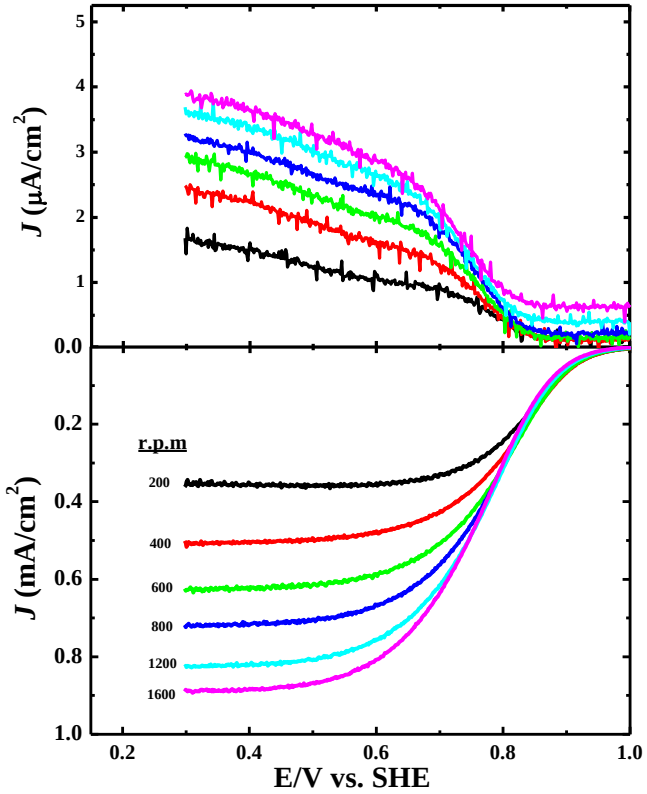


Figure S7

The figure represents the rotation-dependent polarization curves registered for ORR with dendritic Pt nanoelectrocatalyst-modified electrode in 0.5 M H_2SO_4. Scan rate: 5 mV/s. Ring potential: 0.85 V.



$$\frac{1}{J} = \frac{1}{J_d} + \frac{1}{J_k} \quad \text{.....(1)}$$

$$\frac{1}{J} = \frac{1}{0.62nFC_0D^{2/3}\nu^{-1/6}\omega^{1/2}} + \frac{1}{nFkC_0} \quad \text{.....(2)}$$

Polarization curves were analyzed by Kouckety-Levich equations (1) and (2), where J_d is the diffusion limited current density and J_k is the kinetic current density, respectively; 'ω' is the angular velocity, 'n' is the number of electrons transferred, 'F' is Faraday's constant, 'C' is the concentration of dissolved oxygen, 'D' is the diffusion coefficient of

oxygen, 'ν' is the kinematic viscosity of solution and '*k'* is the apparent electron transfer rate constant. The flow of current at the ring is negligible with respect to the current observed at the disk. For instance, the flow of ring-current at potential > 0.75 V was observed ≤ 0.5 μA and the ring current at <0.7 V was ~1–4 μA. This is negligible with respect to the disk current (~1 mA) obtained. Thus it is considered that the 4 electron pathway is the main reaction on the nanoparticle-based electrodes.

Figure S8

Plot comparing the kinetic current density of the three catalysts at 0.9 V

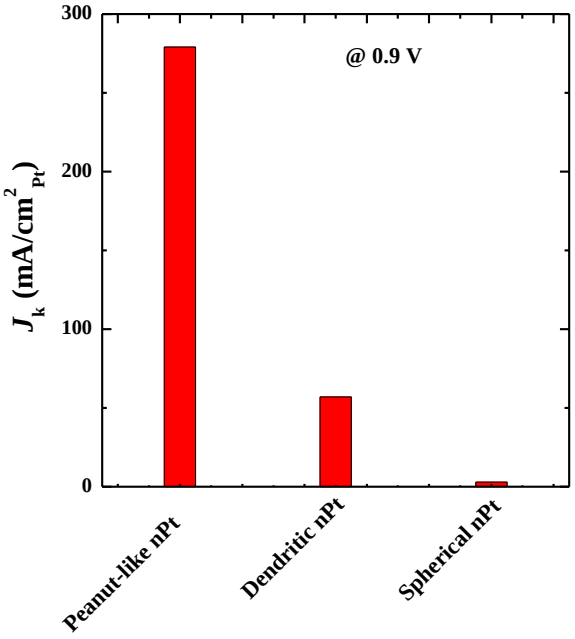


Figure S9

Polarization curve illustrating the effect of catalyst support in the ORR. The polarization curve for ORR with MCNT-supported (a) and unsupported (b) dendritic Pt nanostructure. The mass loading was kept constant in both the cases.