Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information: Aligned Platinum Nanowire Networks from Surface-Oriented Lipid Cubic Phase Templates

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S1. Simulated scattering pattern for Fd3m symmetry where the (111) plane is aligned parallel to the substrate

The phase and lattice parameter of the sample are identified from the characteristic peaks shown in the 1D scattering profile. The d spacing, *d* and the lattice parameter, *a* are related to the Miller indices of the reflection, (*hkl*), by

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

The azimuthal angle, χ between the uniaxial axis of rotation (horizontal on the images) and a given predicted spot is approximately given by

$$\cos(\chi) = \frac{[h^r k^r l^r] \cdot [hkl]}{|[h^r k^r l^r]||[hkl]|}$$

Where $[h^r k^r l^r]$ is the reflection being simulated and [*hkl*] is the uniaxial axis of rotation located parallel to the substrate normal ([111] for Q_{II}^D and [110] for Q_{II}^G). For each (hkl) reflection there are multiple {hkl} combinations that contribute to the scattering where |(hkl)|=|{hkl}| and for each of these {hkl} variation there are reflections with azimuthal angles ±χ. The distance in pixels of the spots from the centre was found with,

$$r = D\tan 2\theta$$

where *D* is the distance between the sample and detector in pixels and θ is taken from Bragg's law,

$$\theta = sin^{-1}\left(\frac{\lambda}{2d}\right)$$

where λ is the wavelength, in the same units as *d*.

Spot positions in pixels were then given by

$$z = rsin(\chi) + x_0$$

$$y = rcos(\chi) + y_0$$

where (x_0, y_0) are the pixel coordinates of the beam centre.

The approximation used is valid for scattering at the small angles with reflections occurring when the [hkl] direction is approaching the plane of the detector, perpendicular to the beam direction. The X-ray wavelength (0.99 Å) was small compared to the d spacing of the reflections (>50 Å) so this approximation is reasonable.

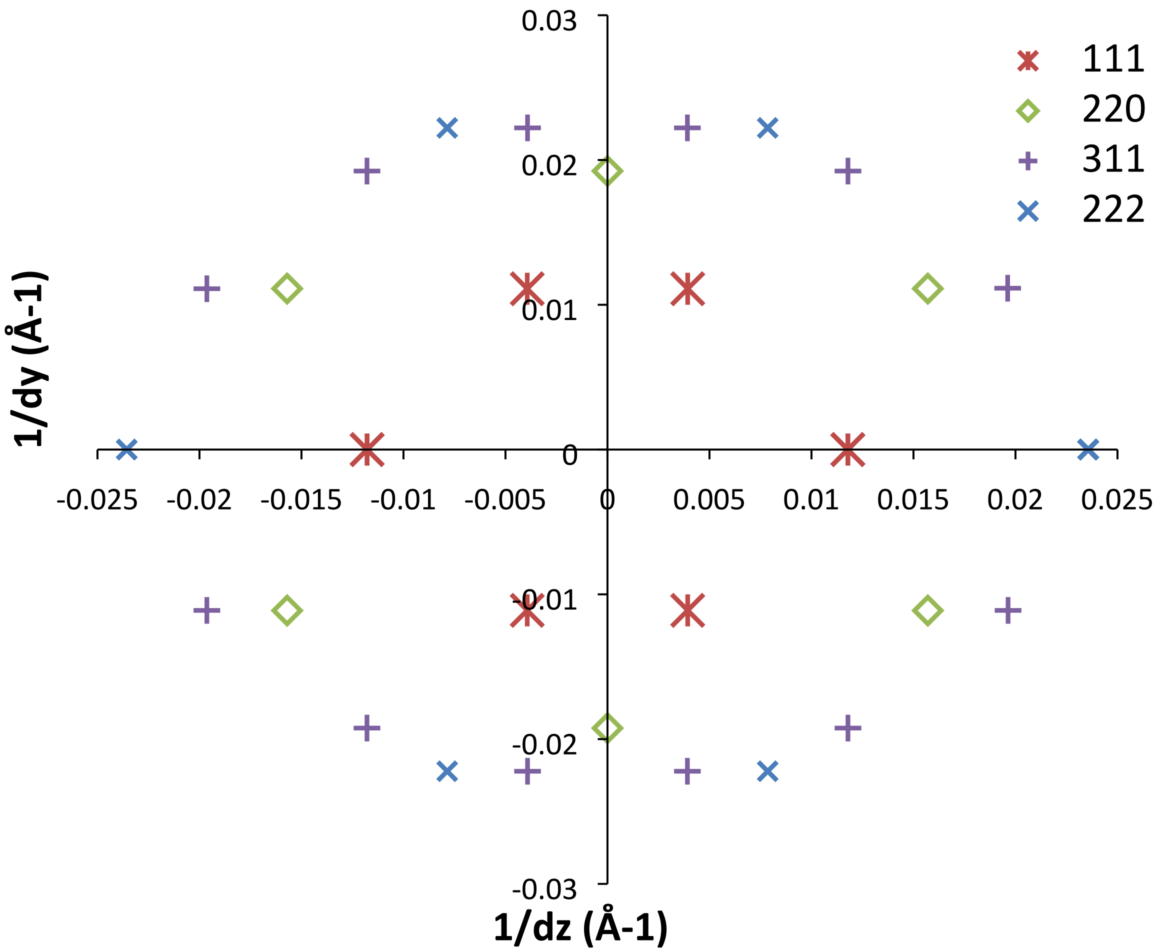

Figure S1. Predicted scattering pattern for a structure with Fd3m morphology orientated with the (111) plane parallel to the $1/d_y$ axis.

S2. SAXS image taken in the zy plane

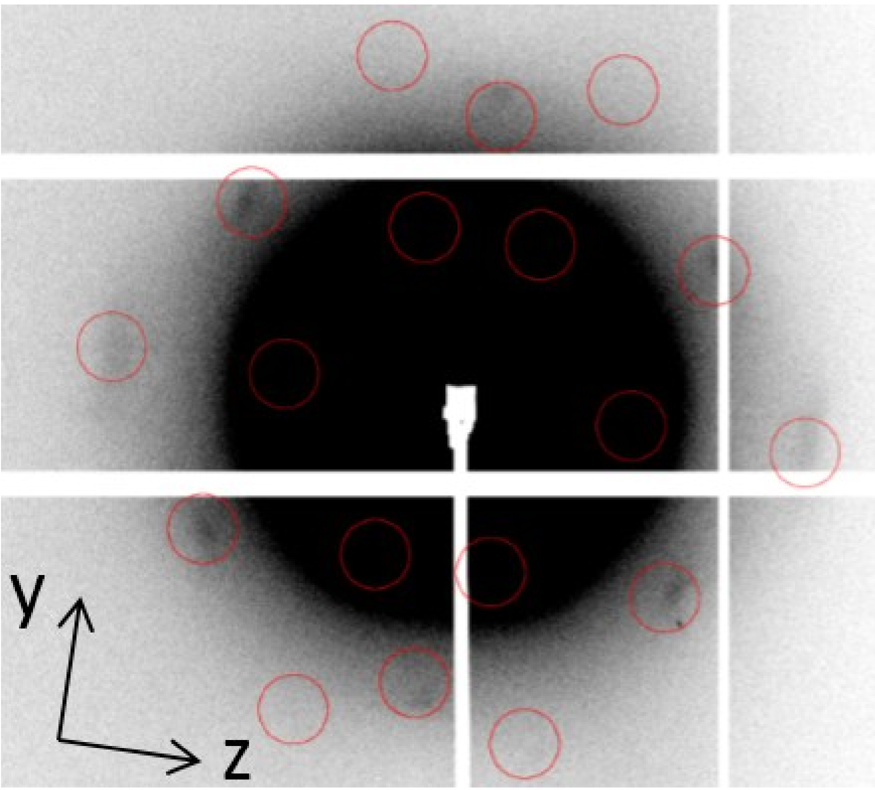

Figure S2. SAXS image of Nanostructured platinum film taken in the zy plane. Red circles show the predicted spot pattern for a structure with Fd3m morphology and the (111) plane aligned parallel to the y direction. Predicted pattern for the √3, √8 and √12 peaks.

S3. Radial Integrations for Platinum Nanostructure

Radial profiles within 20° wedges extending in the positive and negative z, x and y directions from the centre of the SAXS images shown in Fig. 2 were taken in the xy and zy plane. The average signal from the wedges extending in the positive and negative of each direction are shown in Fig. S3. As the √8 and √12 dots measured in the zy plane are so localized, 20° wedges were chosen in order to see either spots in the radial profiles from the z and y direction wedges, as averaging over the entire ring would hide the signals. No signal is observed for the √11 peak or from the off axis √12 spots (the full predicted spot pattern for an orientated Fd3m structure is shown in Fig. S1). For uniaxial scattering patterns the intensity of off-axis reflections is reduced compared to on-axis reflections, which is why only the on axis √12 spots can be observed out of the the √11 and √12 peaks.

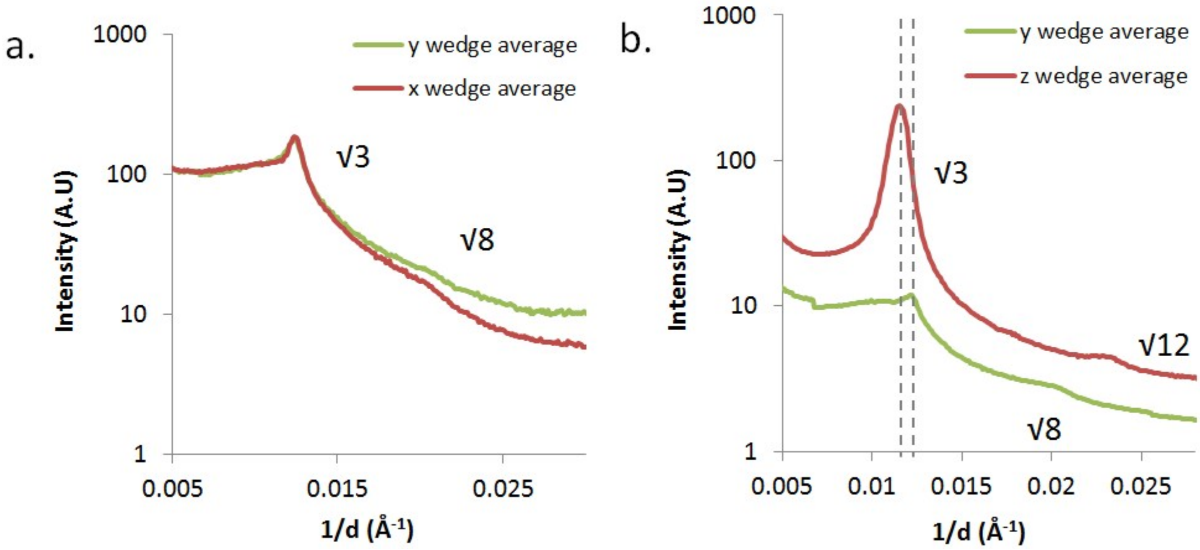

Figure S3. 20° wedge radial integrations for a nanostructured platinum foil measured in the xy plane (a) and the zy plane (b). Wedges were taken from the centre of the image in the positive and negative x,y and z directions with the average signal from the positive and negative wedges shown. Characteristic Bragg peaks have been labelled.

S4. Electrochemical Surface Area Measurement

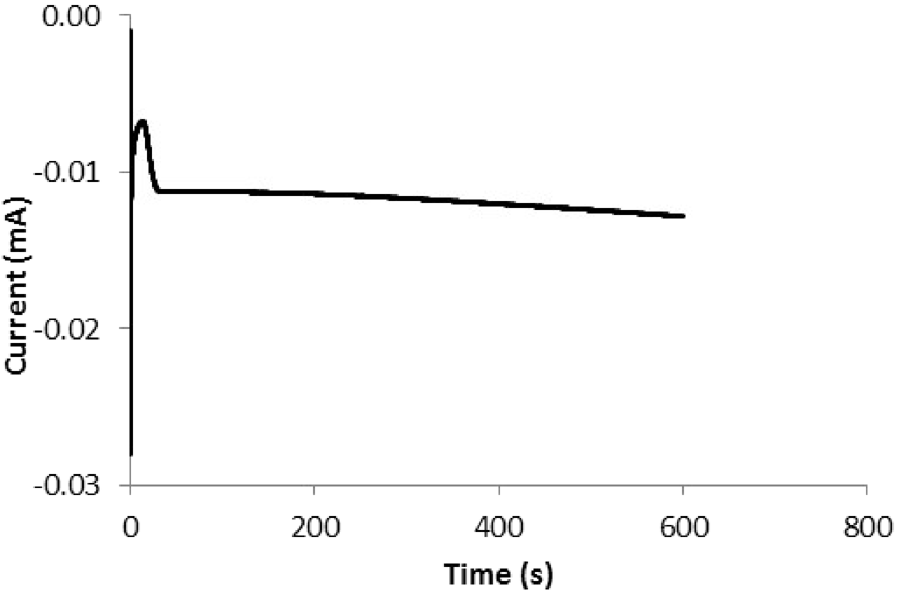

Figure 4a.Representative transient for electrodeposition of phytantriol-directed nanostructured platinum onto 0.5mm diameter gold electrode from 8% w/w hexachloroplatinic acid solution at -0.25 V vs. Ag/AgCl.

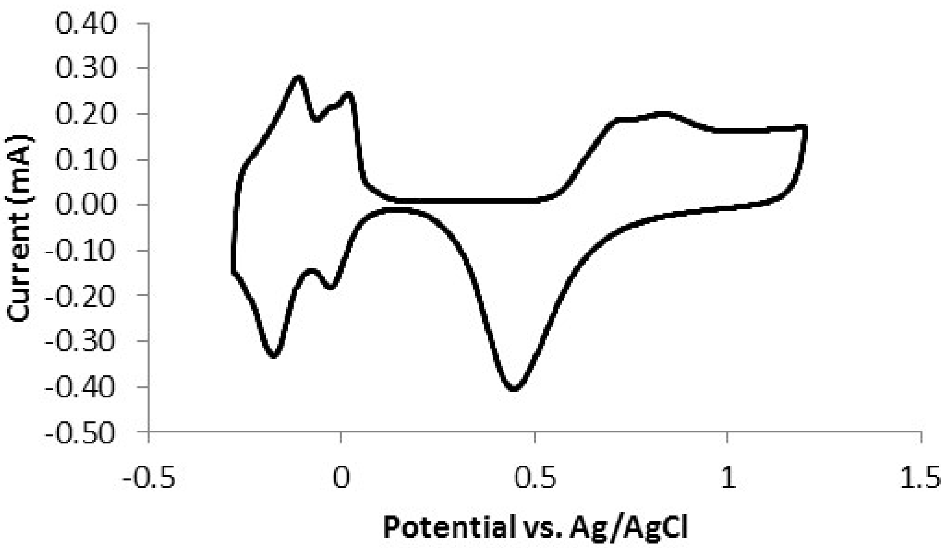

Figure 4b. Representative cyclic voltammetry measurement for templated platinum film deposited for 600s (transient shown in Figure 4a). CV scan carried out in 0.5M H_2SO_4 at

Amount of platinum was estimated from the charge passed during deposition in Figure 4a. Sample surface area was estimated from the charge passed in the hydride region (0.1 to -0.3V) in Figure 4b. These values were combined to give a specific surface area of 44 ± 1 m^2/g

S5. Radial and Azimuthal Profiles for Phytantriol Coated Gold Foil

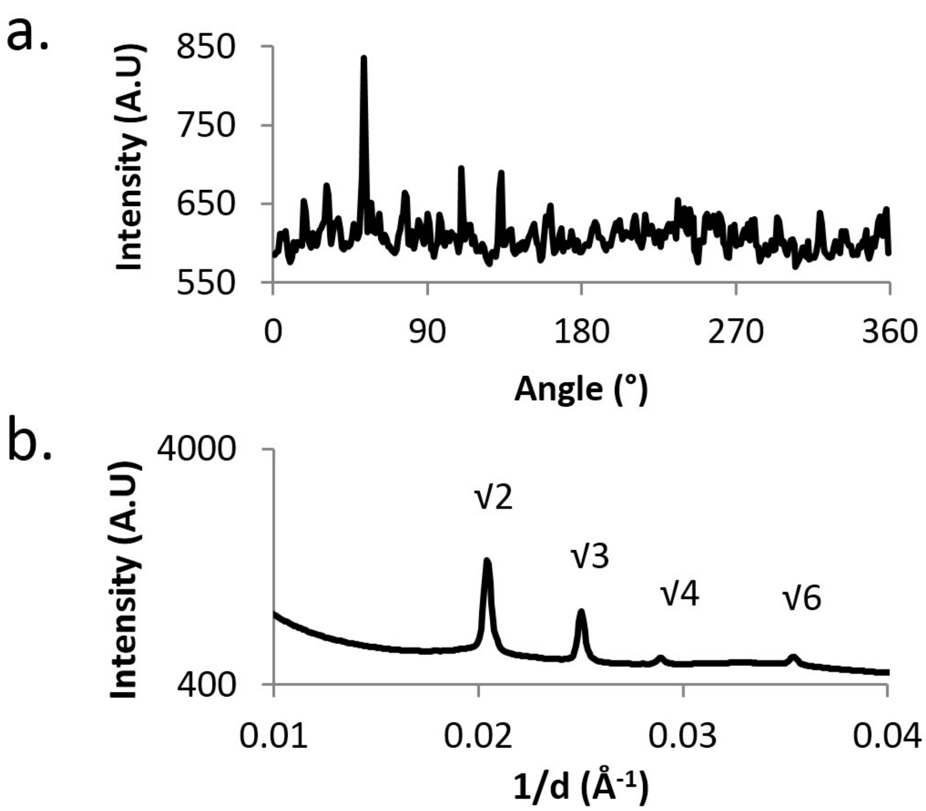

Figure S5. Azimuthal (a) and radial (b) profiles of the SAXS pattern shown in Fig. 4 taken of hydrated phytantriol coated gold foil. Characteristic Bragg peaks for Pn3m space group are labelled on radial profile.

S6. SEM Film Thickness Measurements

SEM images were taken of platinum films in order to estimate film thickness. Films were mounted onto adhesive carbon discs as shown in Fig S5a.

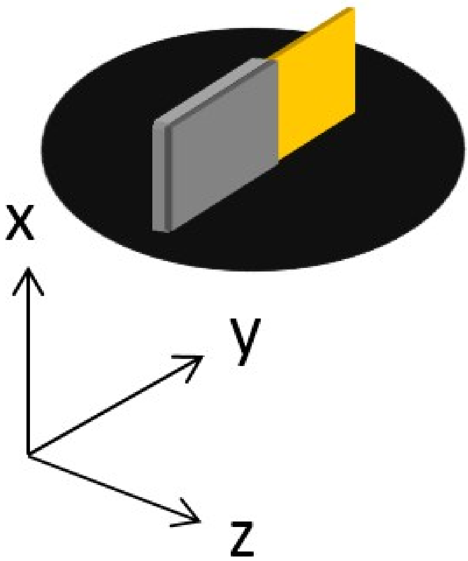

Figure S6a. Schematic of SEM experiment set up with experimental axis

Representative SEM images are shown in Fig. S5b. Three images were taken of either side of each film in order to estimate the thickness and confirm even deposition on either side of the substrate. Elemental analysis was performed in order to confirm the gold substrate and platinum film.

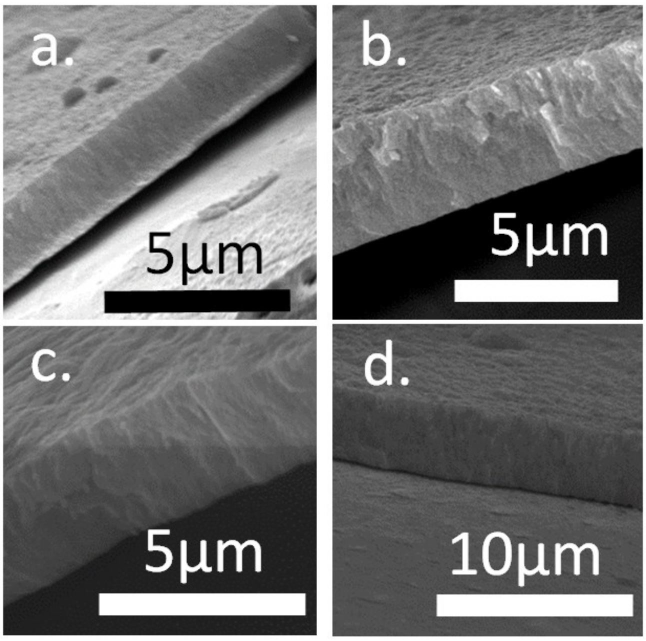

Figure S6b. Representative SEM images taken in zy plane for platinum film estimated to be (a) 1.9 ± 0.2 µm, (b) 2.5 ± 0.2 µm, (c) 2.8 ± 0.3 µm and (d) 3.3 ± 0.2 µm.