Electronic Supplementary Material (ESI) for Analyst.

Electronic Supplementary Information

Fast quantification of nanorod geometry by DMA-spICP-MS

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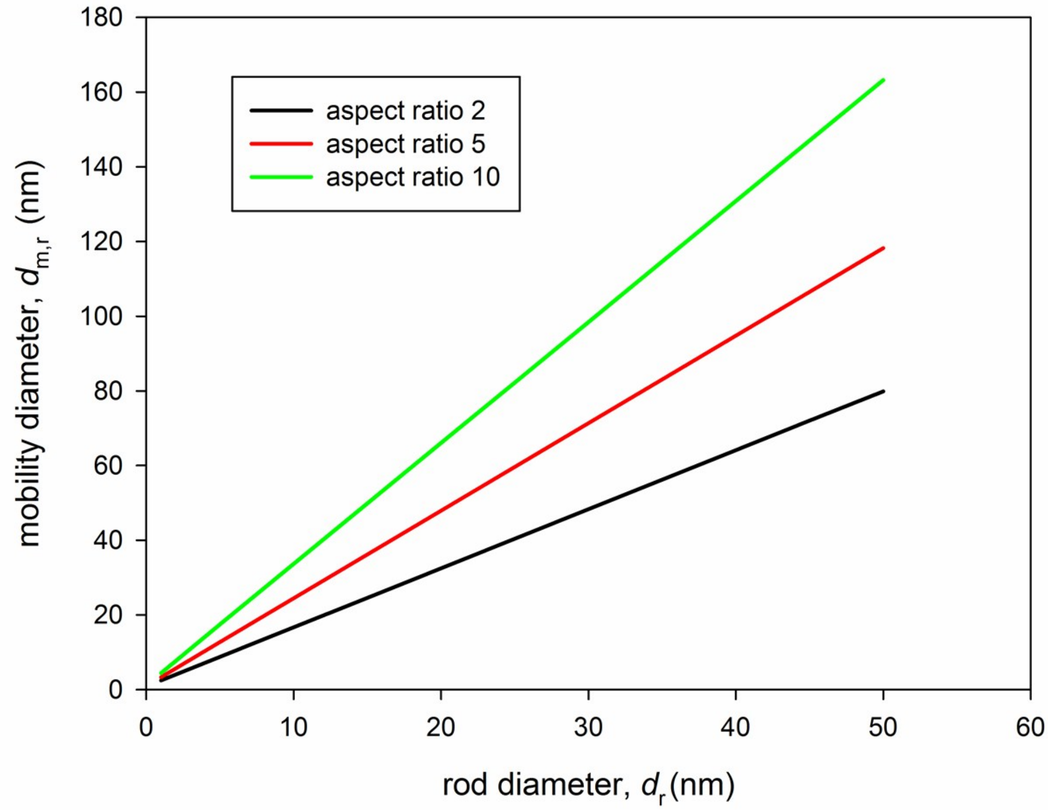

Figure S1. Graphical presentation of Eq. (1) showing the relationship between mobility diameter and rod (cylindrical) diameter as a function of aspect ratio (L_r/d_r) for model rods. $\Delta d_{gas} = 0.68$ nm.

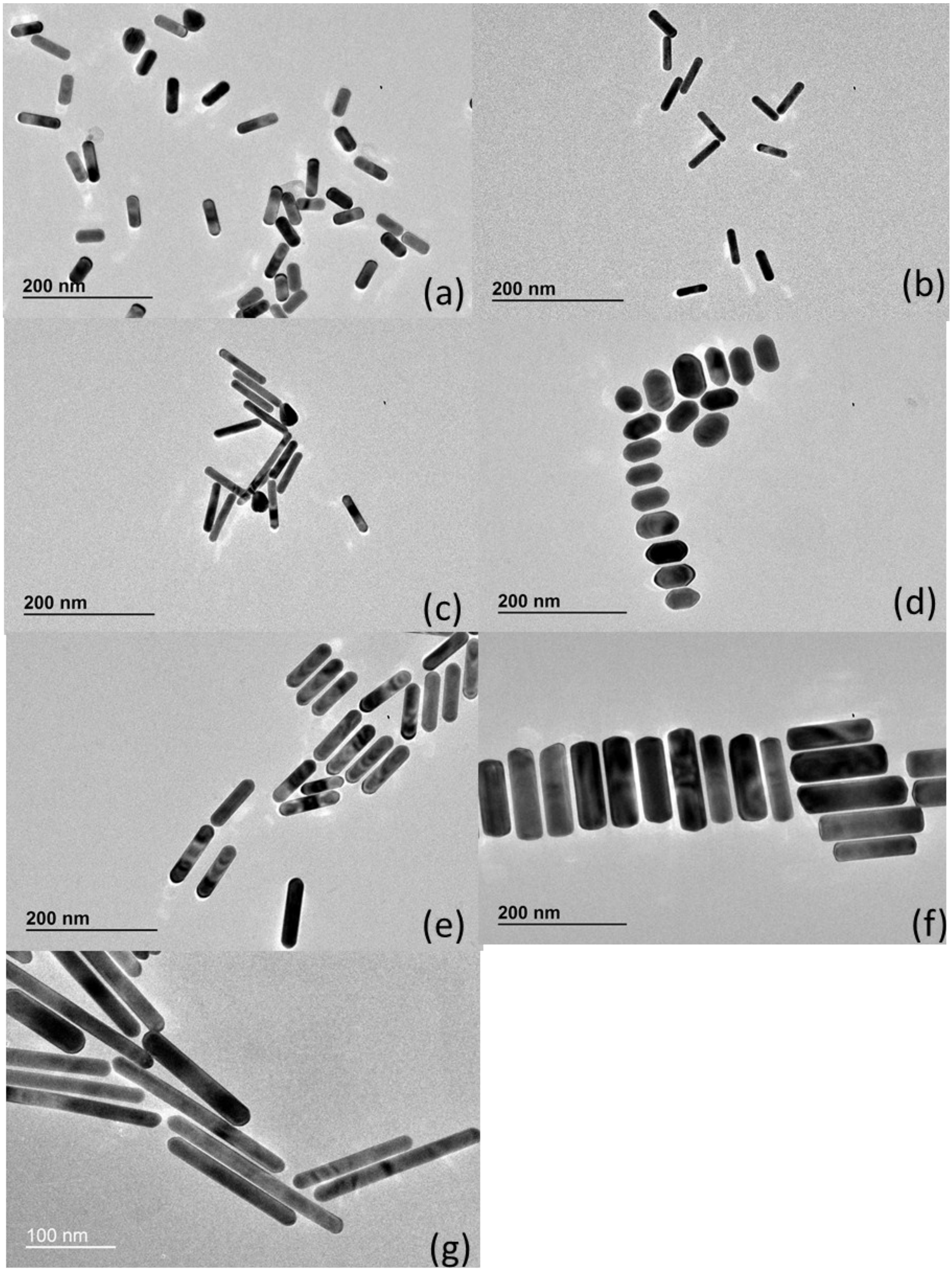

Figure S2. TEM image for GNRs (a) CIT-660 (b) CIT-800 (c) CIT-980 (d) CTAB-600 (e) CTAB-20-850 (f) CTAB-40-850 (g) CTAB-1400

Table S1. Dimensions of GNRs as provided by the vendors (based on TEM) (+/- values represent 1 standard deviation).

GNRs	**Diameter (d_r, nm)**	**Length (L_r, nm)**	**Aspect Ratio (*AR*)**
CIT-660	17.4 ± 1.2	45.5 ± 6.3	2.6
CIT-800	12.5 ± 1.4	50.8 ± 5.0	4.1
CIT-980	12.1 ± 0.8	69.7 ± 7.3	5.8
CTAB-600	25	57	2.3
CTAB-20-850	23	89	3.9
CTAB-40-850	44	160	3.6
CTAB-1400	25	256	10.2

Estimating Adlayer Thickness on GNRs

To estimate the mean adlayer thickness on GNRs, approximately 10 GNRs were analyzed by TEM for each sample and using different locations on the grid within a single GNR sample. For the case where thickness was non-uniform, different locations were randomly selected along the GNR and averaged. Figure S2 shows the effect of sample dilution and collection method on results. A relatively large standard deviation for adlayer thickness was observed as represented in Figures S2 and S3. The reason for the large variation in thickness is not clearly understood. It is presumed to be the result of the manufacturing process and partially due to non-uniformities in the electrospray droplets and non-uniform drying process along the rod, which yields non-uniform non-volatile layer thickness (Figure S4).

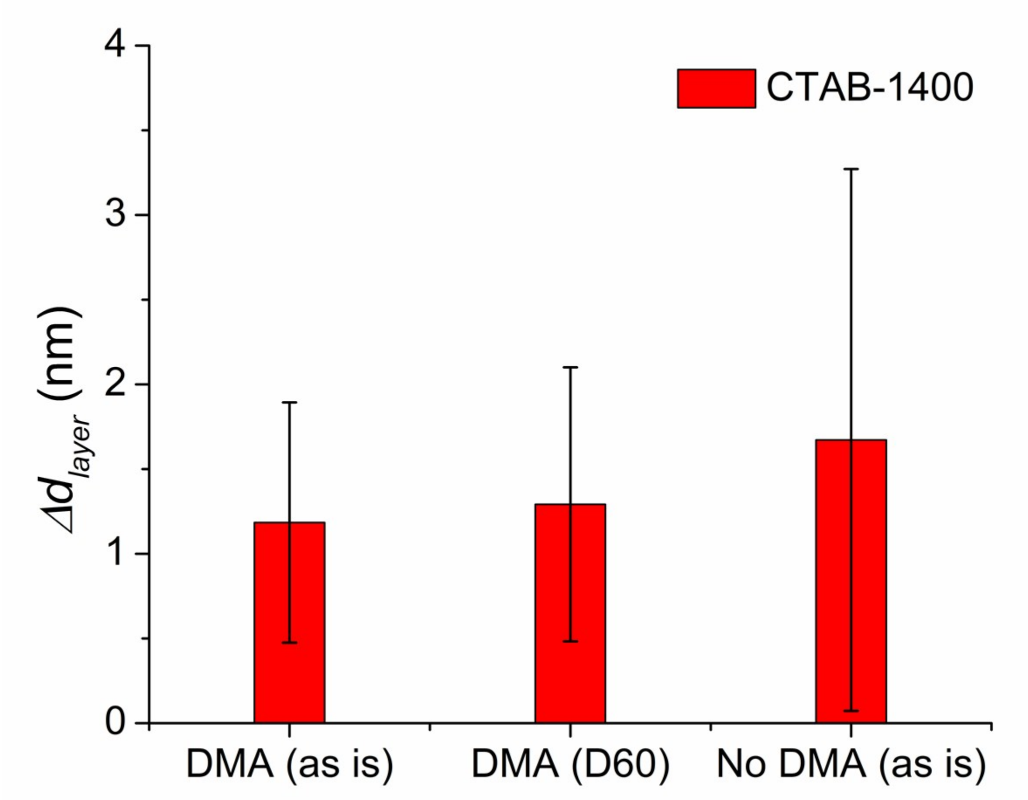

Figure S3. Measurement of adlayer thickness showing the effect of dilution and collection method. D60 indicates 60× dilution compared with the native suspension. The adlayer thickness observed with DMA size selection is compared with that without DMA selection. Neither the effect of dilution nor DMA selection has an obvious effect on adlayer thickness. Roughly 10 GNRs and multiple locations along each GNR were measured to yield an average and one standard deviation.

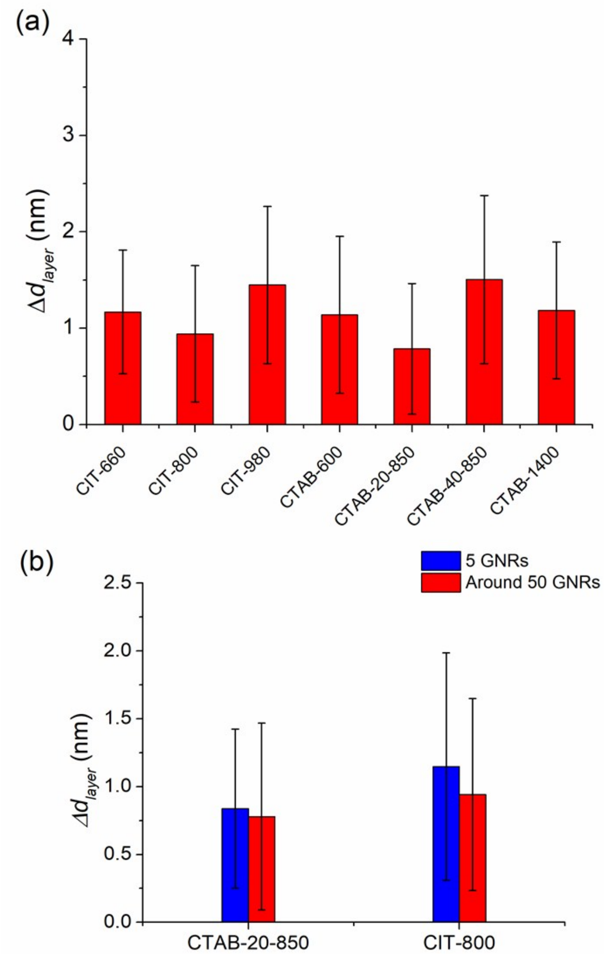

Figure S4. Measurement of adlayer thickness and effect of GNR sampling number. (a) Adlayer thickness of all GNR samples by TEM imaging of electrostatically deposited GNRs at peak size selected by DMA and based on the analysis of 10 GNRs per sample. (b) Comparison of number of GNRs randomly sampled (5 vs. roughly 50) on the determination of layer thickness for both CTAB and CIT coated samples. Multiple locations along each GNR were measured to obtain the average and one standard deviation. Results indicate that the adlayer thickness estimated from 10 GNRs is statistically representative of the larger population (compared to the inherent variations in adlayer thickness present).

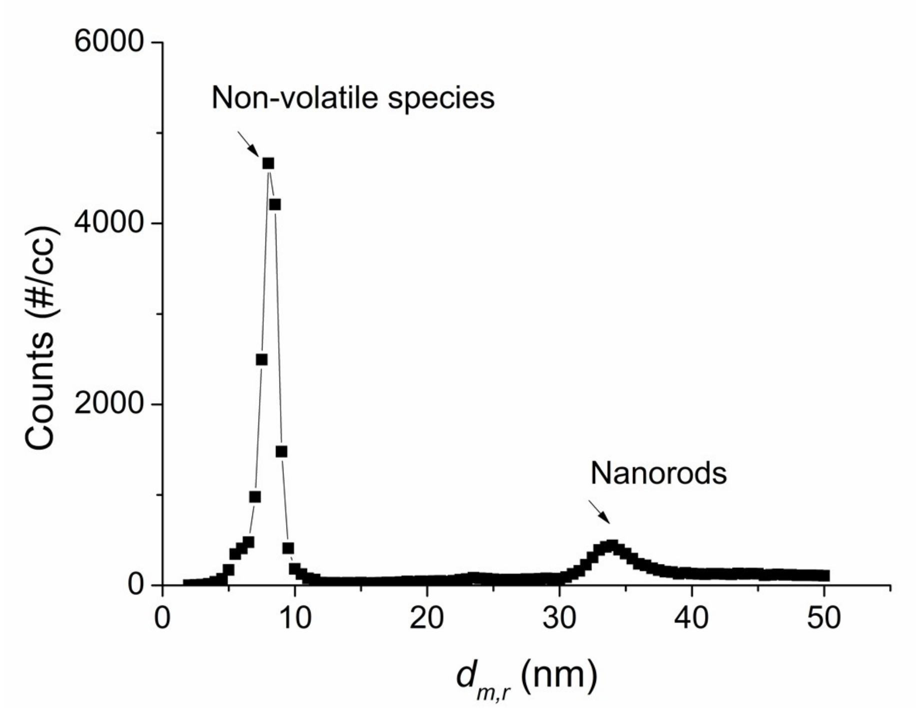

Figure S5. Contribution of non-volatiles from ES to the adlayer thickness. Mobility size distribution of CIT-600 by ES-DMA-CPC (CPC is a condensation particle counter).

The peak at 8 nm is representative of dried particles containing non-volatile species, while the peak at 34 nm is representative of GNRs. The volume of the non-volatile species can be estimated by $d_{m,r}^3$. This same volume of non-volatile species will form an adlayer thickness (Δr) on the GNR surface with radius of r and length of L. These parameters follow from Eq. (1):

$$\frac{\pi}{6}d_{m,r}^{\ 3} = \pi(r+\Delta r)^2L - \pi r^2 = \pi\Delta r^2L + 2\pi r\Delta rL \quad . \qquad (1)$$

The contribution of non-volatiles from ES (i.e., Δr) was calculated based on Eq. (1).

Table S2: Contribution of non-volatiles from ES to layer thickness (nm)

GNRs	**Contribution from ES to adlayer thickness (nm)**
CIT-660	0.2
CIT-800	2.2
CIT-980	0.1
CTAB-600	1.1
CTAB-20-850	0.1
CTAB-40-850	0.1
CTAB-1400	0.3