Supporting Information

A Supramolecular Polyethylenimine-cored Carbazole Dendritic Polymer with Dual Applications

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Calculation of the carbazole groups per complex

Take the PEI-G0 for example:
Molar extinction coefficient (ε)=4.046 × 10^3 (mol/L·cm)$^{-1}$ at the absorption peak of 343 nm.
The PEI-G0 was diluted 100 times for UV-vis spectrum measurement.
$c(carbazole) = 100 \times \frac{A}{\varepsilon l} = 100 \times \frac{1.19}{4.064 \times 1000 \times 1}$ = 0.0293 mol/L =29.3 mol/L
For G0-COOH, the concentration of COOH group = c(carbazole)=29.3 mol/L

$c(PEI) = 20 \times \frac{1.43}{10.86}$=2.63 mg/mL=0.263 mmol/L.
The concentration of amine groups = 230×0.263 mmol/L=60.5 mmol/L.(c(NH_2-)=20.0 mmol/L, c(NH-)=24.2mmol/L, c(N-)=16.3 mmol/L)

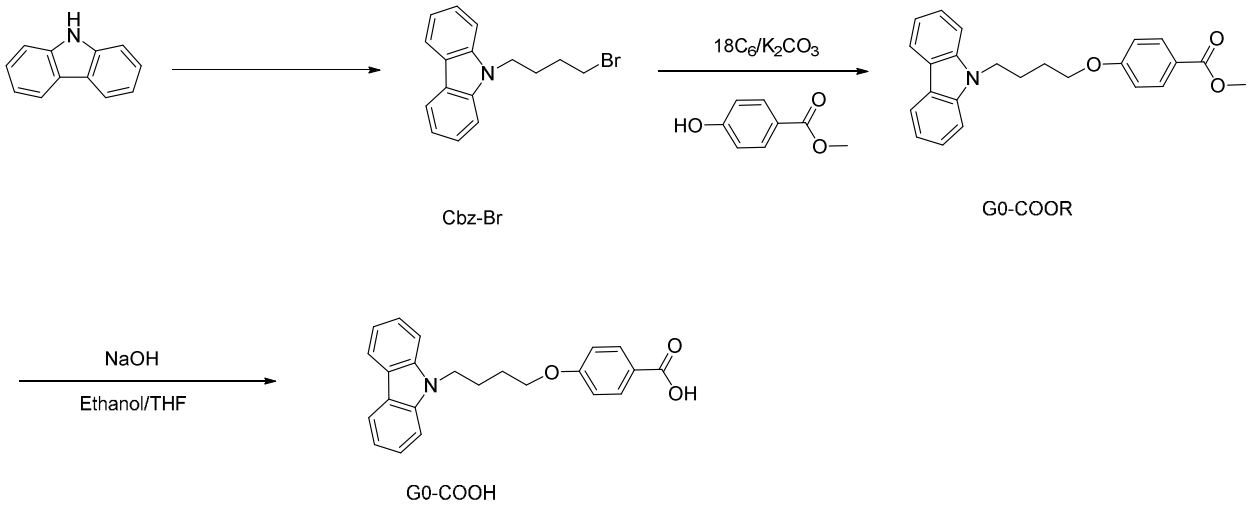
The carbazole per PEI molecule $N = \frac{\mathrm{c(carbazole)}}{\mathrm{c(PEI)}} = \frac{29.3}{0.263}$=111
Therefore, the G0-COOH dendron per PEI molecule is 111.

Similarly, for complex PEI-G1, the carbazole per PEI molecule was calculated to be 79.4.
Therefore, the G1-COOH dendron per PEI molecules is 40.

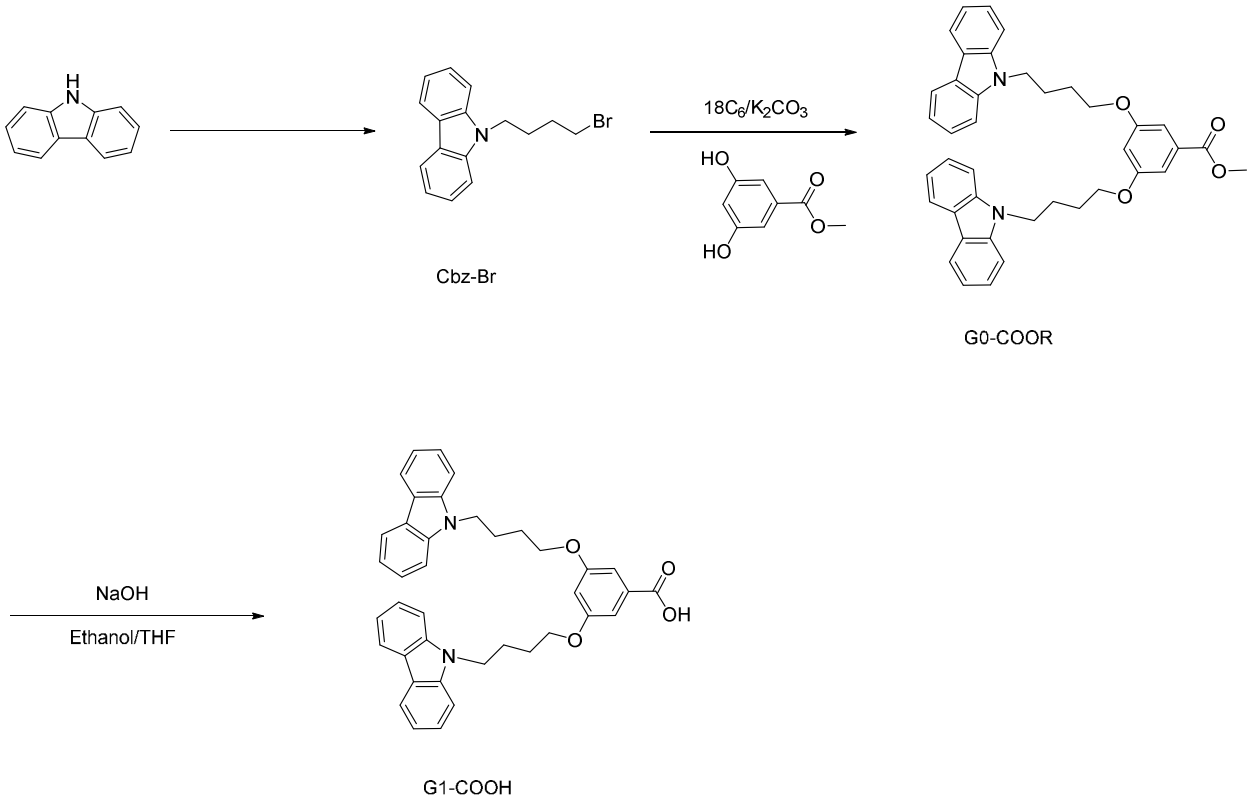
For complex PEI-G2, the carbazole per PEI molecule was calculated to be 81.2.
Therefore, the G2-COOH dendron per PEI molecules is 20.

Calculation of the molecular weight of the complex

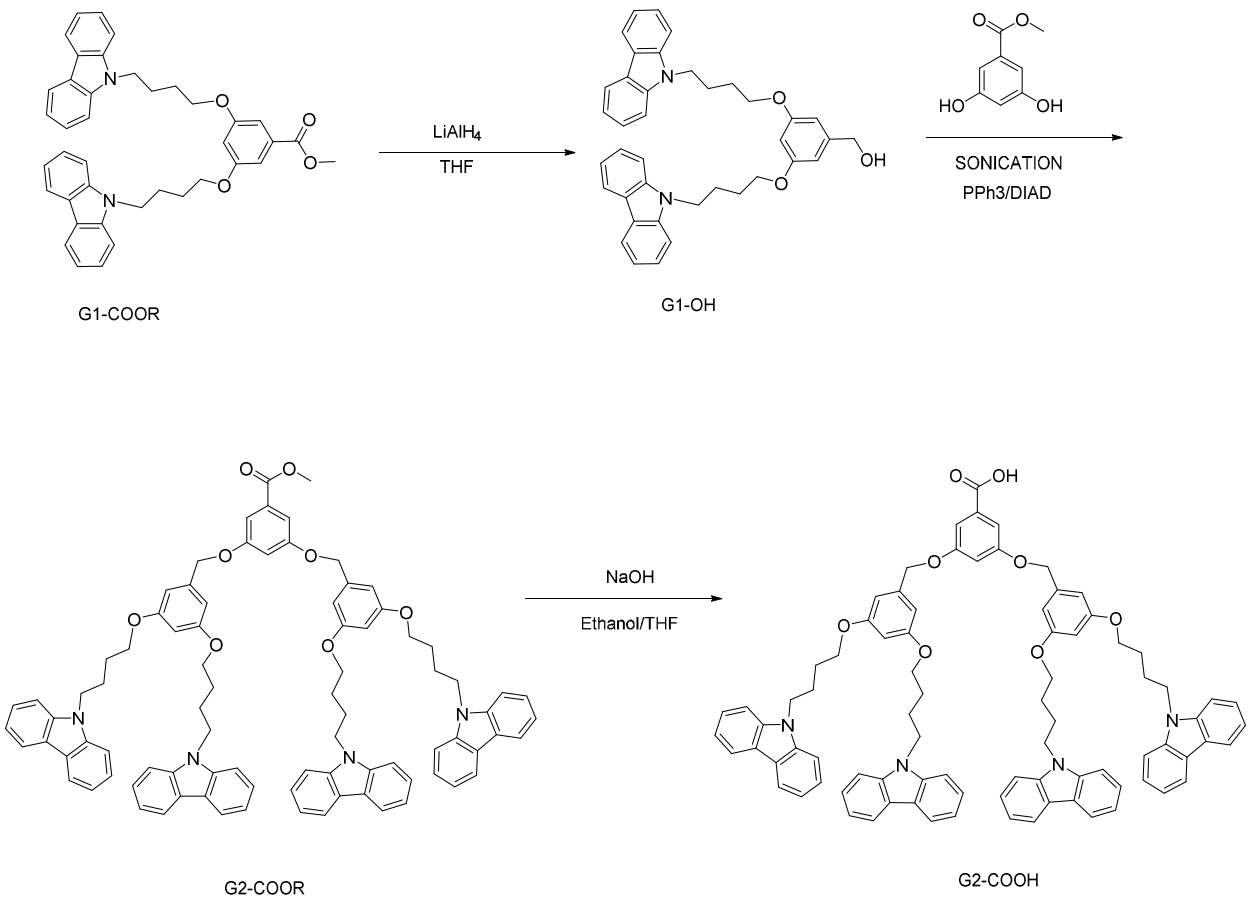
Mw (PEI-G0 complex) = Mw (PEI) + N1×Mw(G0-COOH) = 10,000 + 111×359.43 = 49.8 kDa
Mw (PE-G1 complex) = Mw (PEI) + N2×Mw(G1-COOH) = 10,000 + 39.7×596.73 = 33.7 kDa
Mw (PE-G2 complex) = Mw (PEI) + N3×Mw(G2-COOH) = 10,000 + 20.3×1283.58 = 36.1 kDa



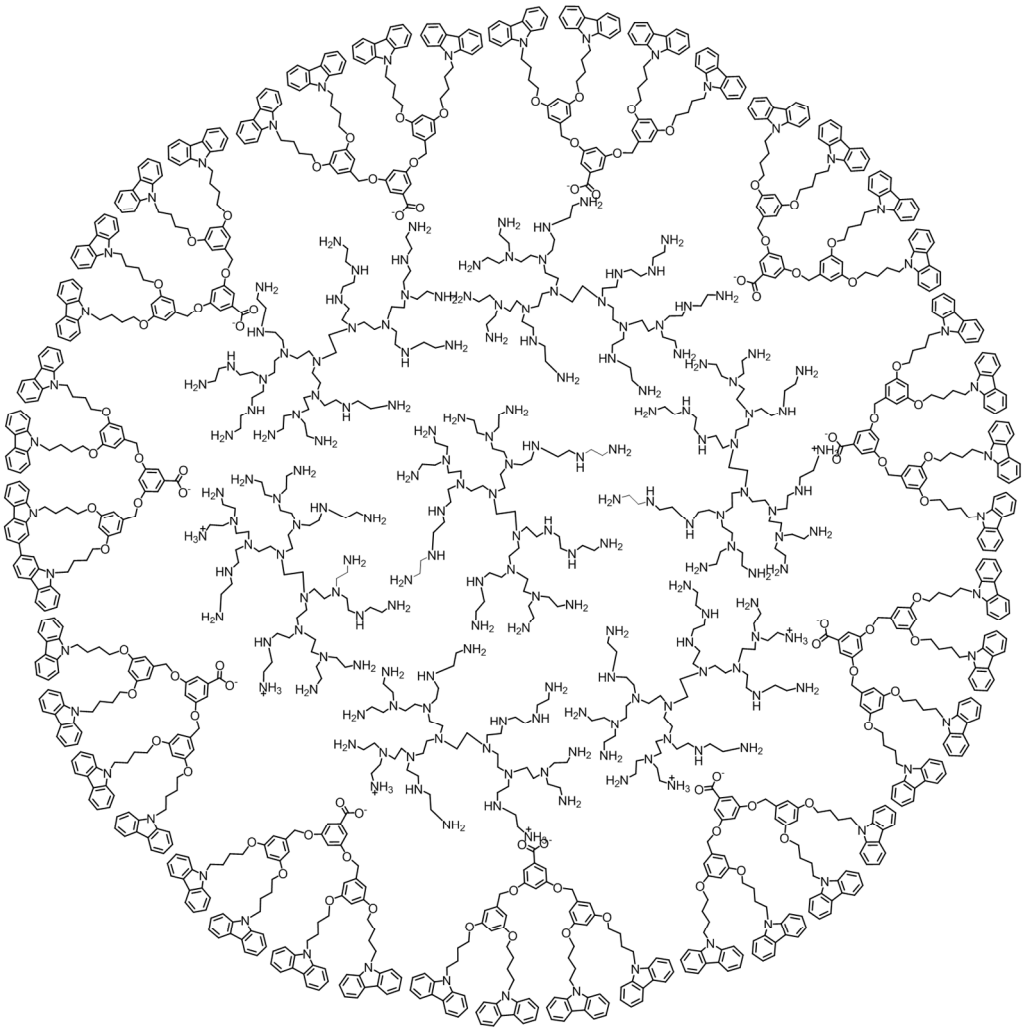
Scheme S1. Synthesis of G0-COOH



Scheme S2. Synthesis of G1-COOH



Scheme S3. Synthesis of G2-COOH



Scheme S4. Demonstration of the supramolecular dendritic multilarm polymer (SDMPs) based on high-generation carbazole dendron.

Table S1. Comparative ratio of carboxylic acid (-COOH) to amines for nanocomplexes with different carbazole generations. The listed numbers are based on one PEI molecule.

	Amines	**Primary amines**	**Secondary amines**	**Tertiary amines**	**-COOH**	**-COOH/amines**
G0-COOH	230	76	92	62	111	0.483
G1-COOH	230	76	92	62	40	0.174
G2-COOH	230	76	92	62	21	0.091

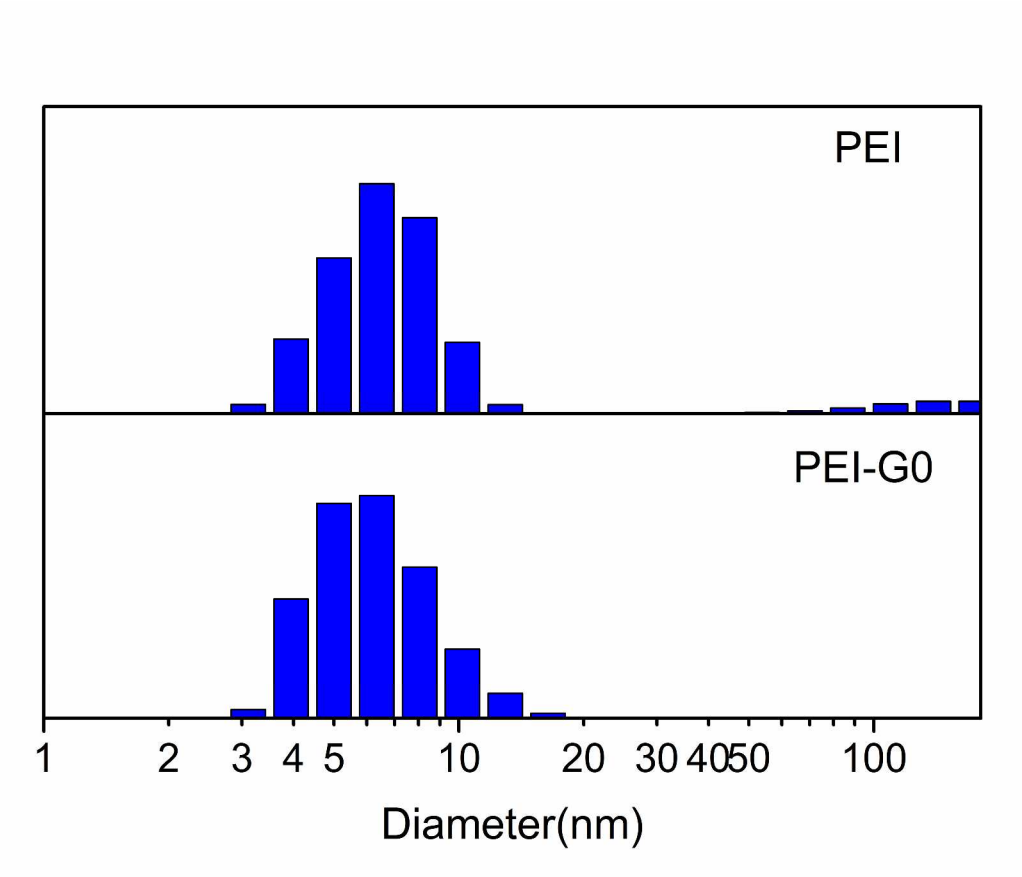


Figure S1. Comparative DLS analysis of PEI and PEI-G0 complex

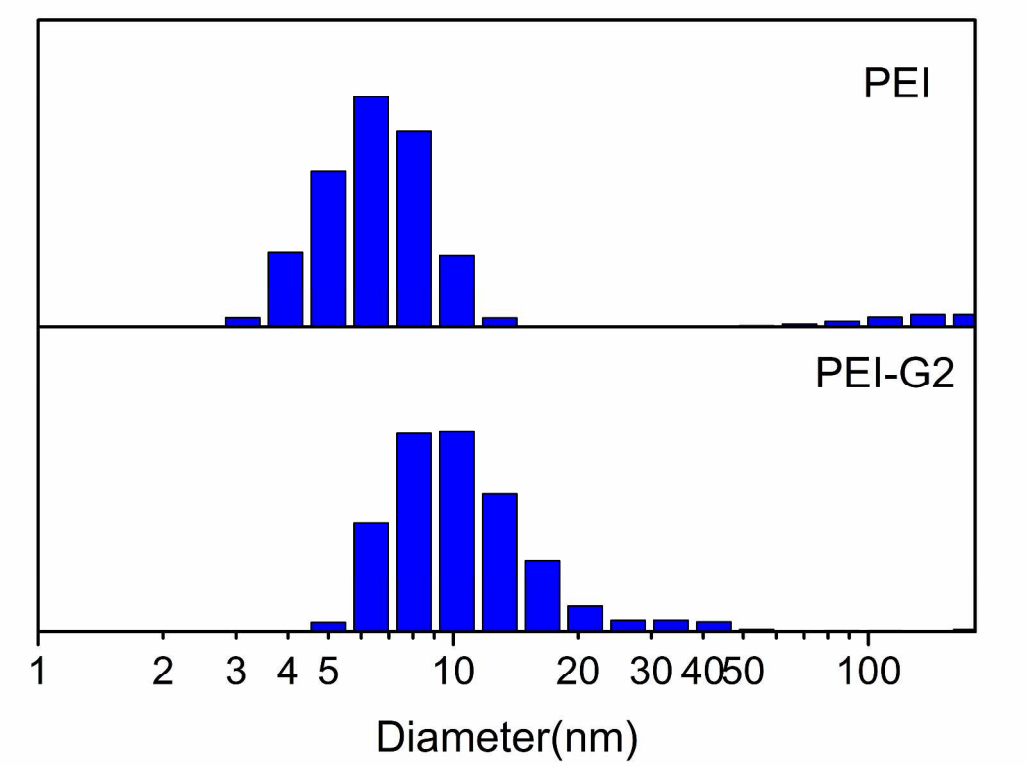


Figure S2. Comparative DLS analysis of PEI and PEI-G2 complex

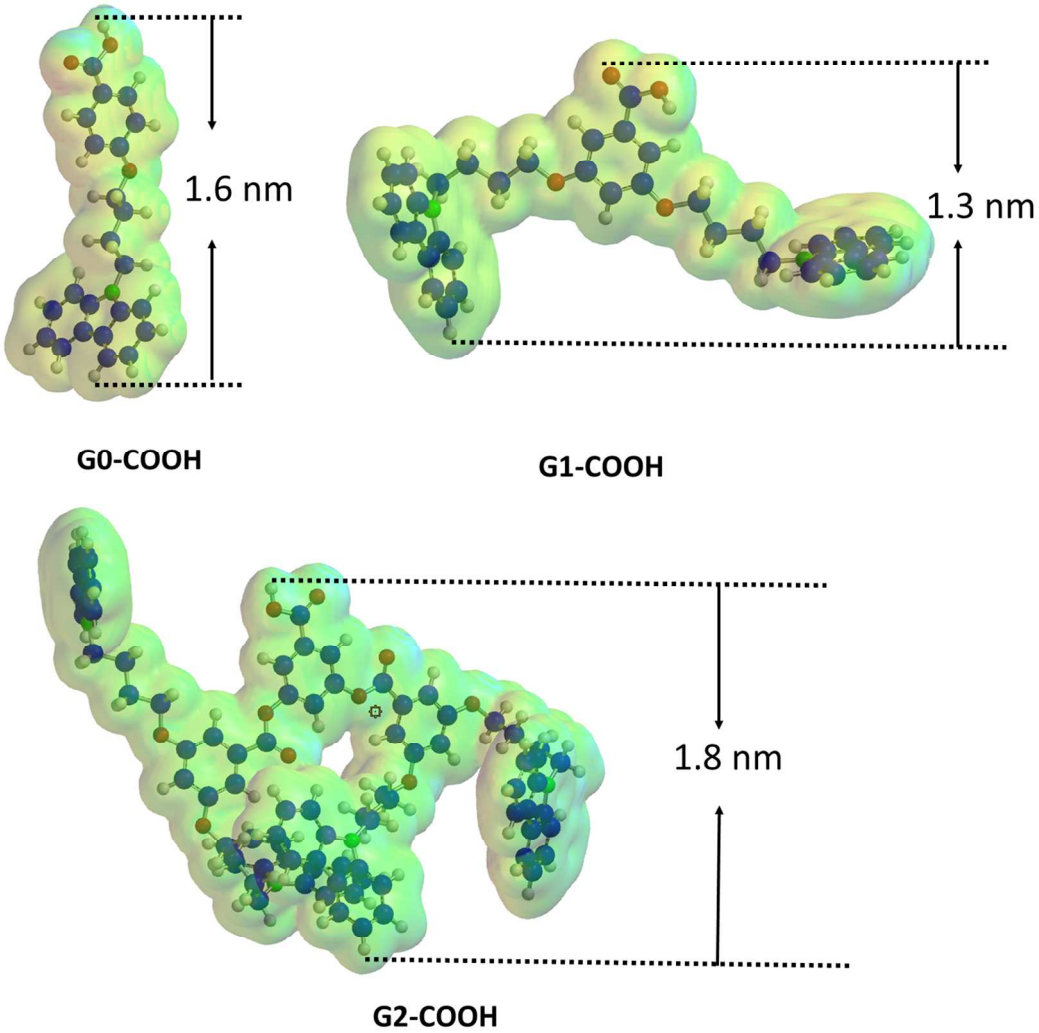


Figure S3. Molecular modelling of the G0-COOH, G1-COOH and G2-COOH by Spantan.

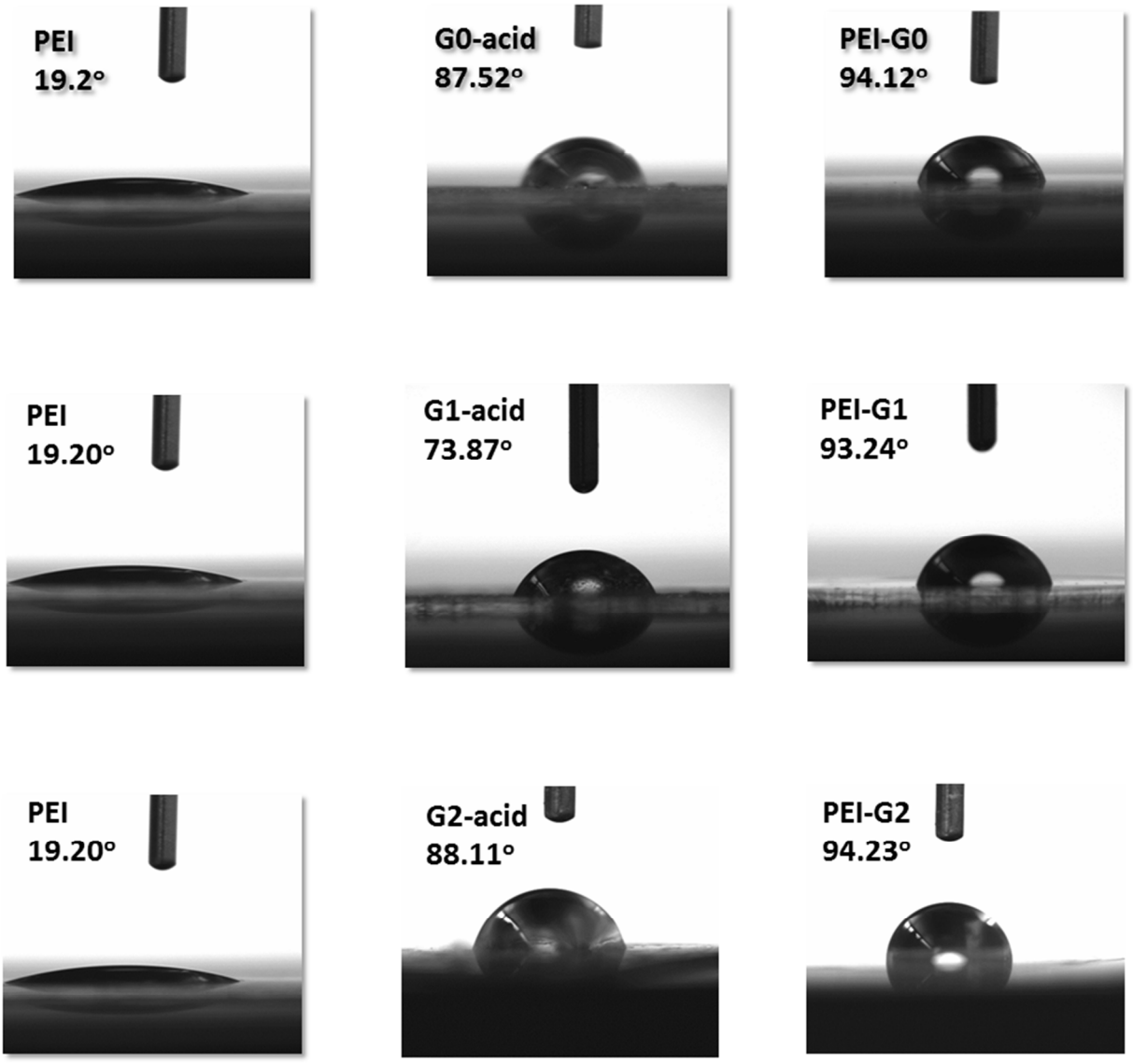


Figure S4. Water Contact Angle Measurement.

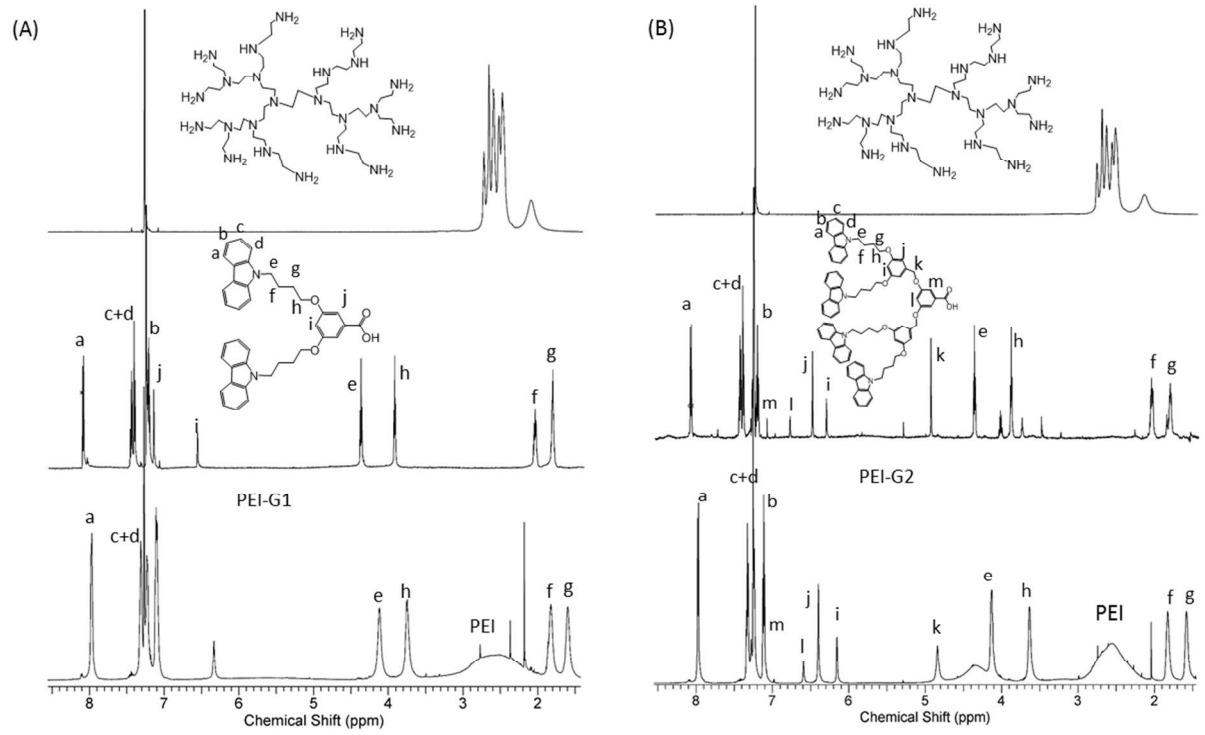


Figure S5. Comparative ^{1}H NMR spectra of (A) PEI, G1-COOH and nanocomplex PEI-G1; (B) PEI, G2-COOH, and nanocomplex PEI-G2.

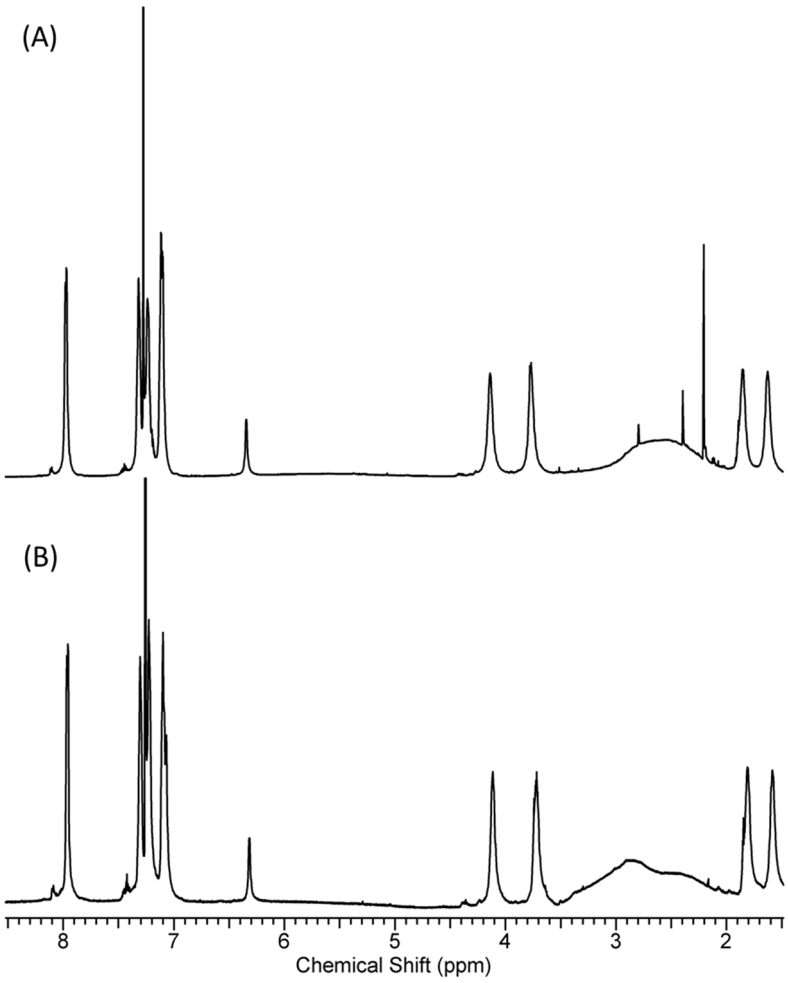


Figure S6. Comparative ^{1}H NMR spectra of the nanocomplex PEI-G1: (A) fresh prepared and (B) two weeks after preparation.

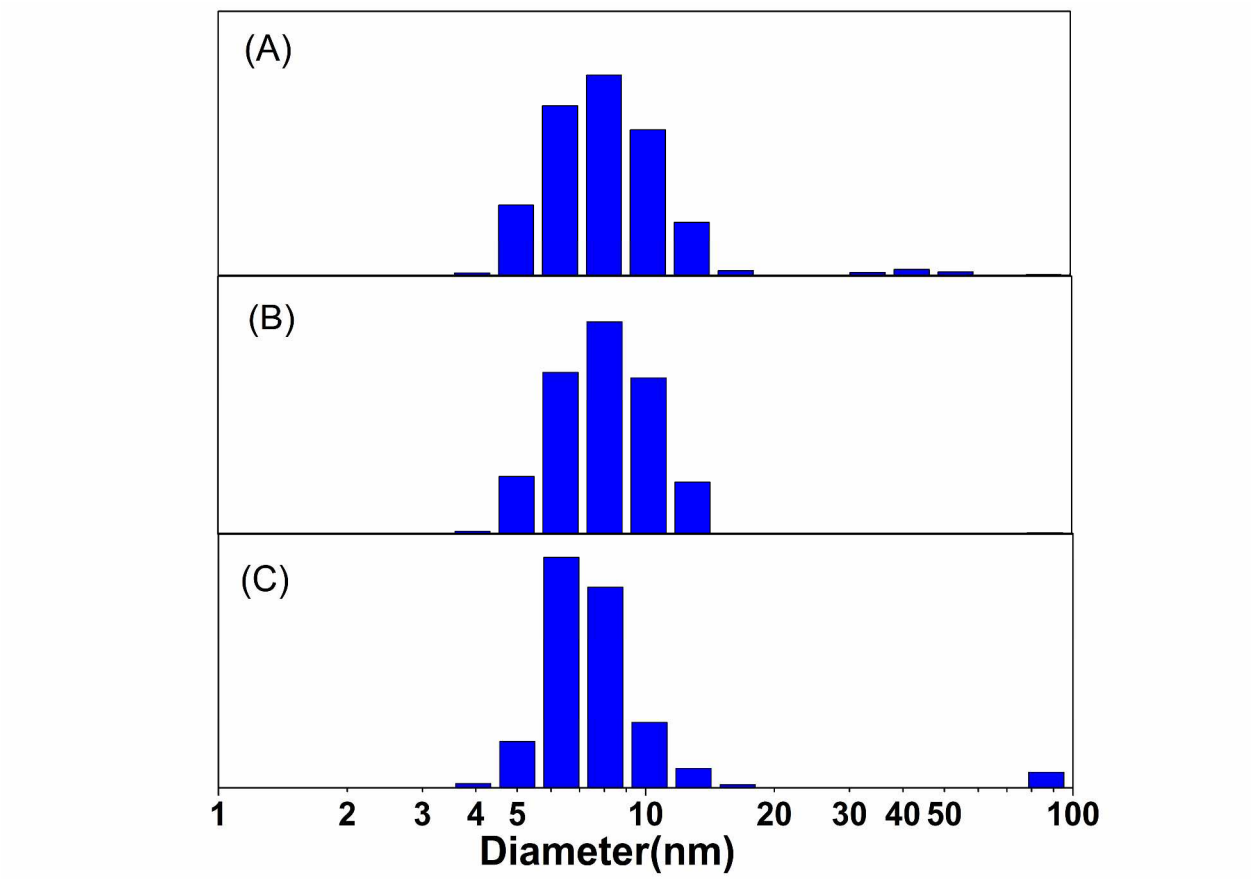


Figure S7. Comparative DLS analysis of the nanocomplex PEI-G1: (A) fresh prepared, (B) one week after preparation and (C) two weeks after preparation.

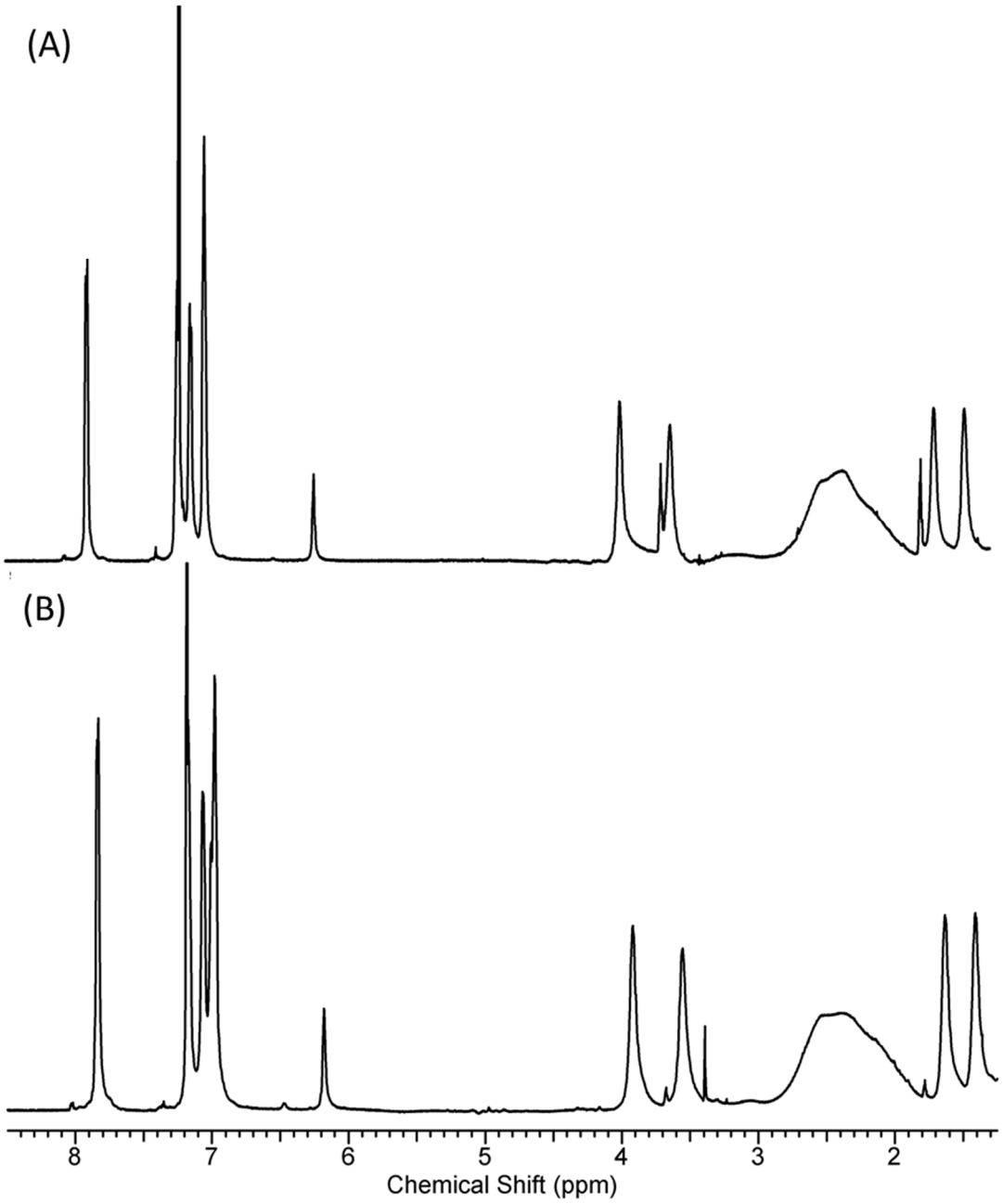


Figure S8. Comparative ^{1}H NMR spectra of nanocomplex PEI-G1: (A) before mixing with water and (B) after mixing with water.

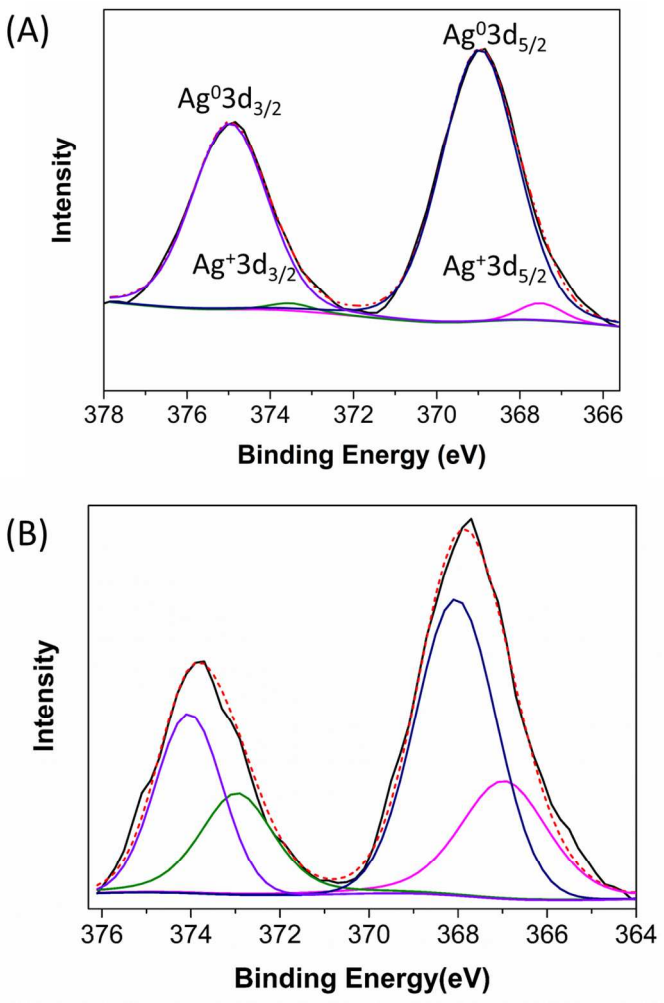


Figure S9. XPS spectra of (A) PEI-G0+1.0 $AgNO_3$, and (B) PEI-G2+1.0 $AgNO_3$.

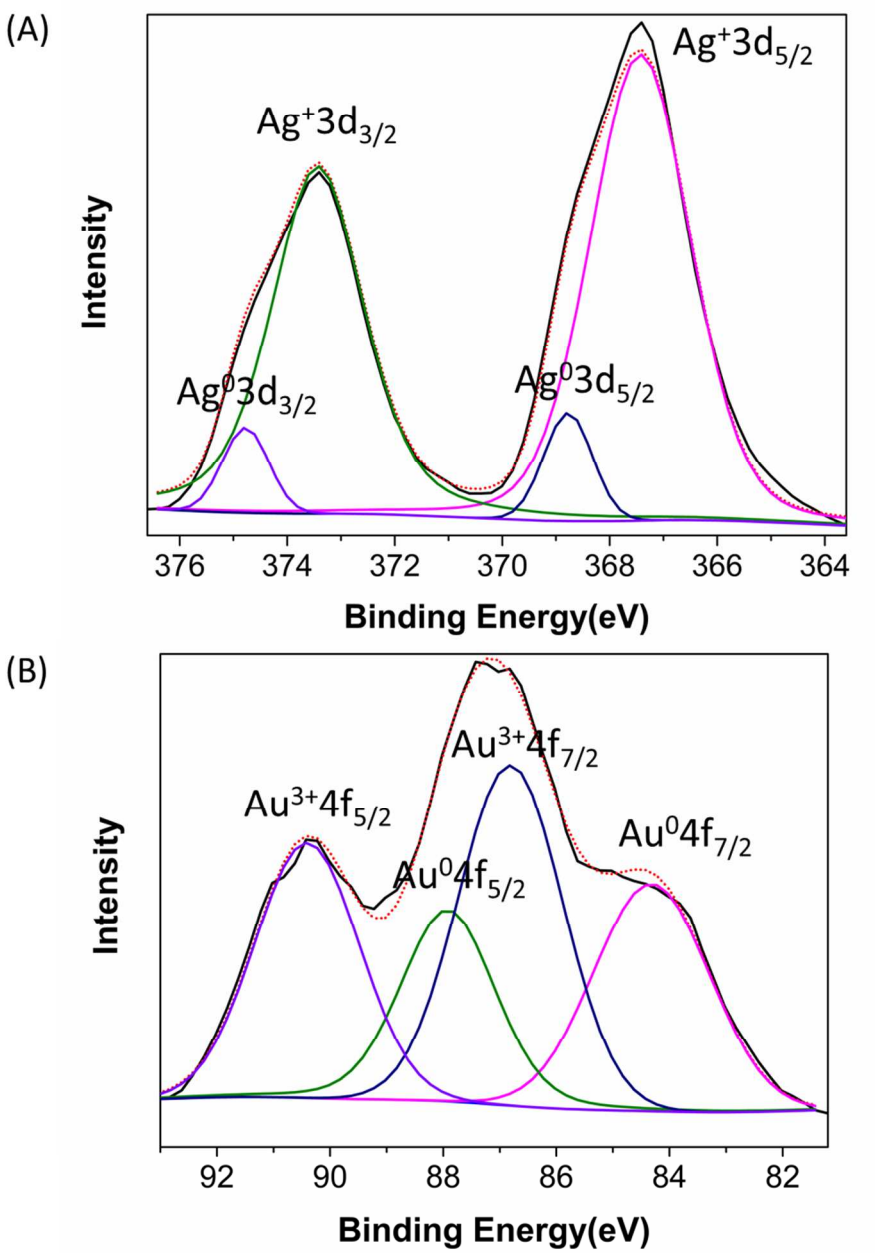


Figure S10. XPS spectra of (A) PEI-PA+1.0 $AgNO_3$ and (B) PEI-PA+0.4 $AuCl_3$.