Electronic Supplementary Material (ESI) for New Journal of Chemistry
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Supporting Information

Preparation of Long Supramolecular Carbon Nanotubes

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Shortening of MWCNTs

MWCNTs were purified and shortened according to reported procedures in literature [1]. Briefly, MWCNTs (2 g) were added to 40 ml of sulfuric/nitric acid mixture (3:1) in a reaction flask and refluxed for 24 h at 120 ºC. The mixture was cooled and diluted by distillated water and then it was filtrated. The product (SCNTs) was washed by distillated water and dried at 60 ºC for 3 h by vacuum oven.

Preparation of ABA type linear-dendritic copolymers containing PEG as B block and PAMAM with periphery amino functional groups as A blocks ($LDNH_2$)

For preparation of linear-dendritic copolymer, first polyethyleneglycol was functionalized by triazine. A solution of polyethylene glycol (4 g) and sodium hydroxide (0.32 g) in 10 mL of water was added to a solution of cyanuric chloride (3.69 g) in 50 mL dichloromethane at 0 ºC. Mixture was stirred at 0 ºC for 1 h, and then it was stirred at room temperature for 1 h and finally was refluxed for additional 6 h. Then mixture was cooled and filtered off and solvent was evaporated. The crude product was dissolved in 10 mL dichloromethane and was precipitated in diethyl ether at 0 ºC several times. The purified product was obtained as a white solid. Therefore it was reacted with ethylenediamine and was used as core for synthesizing PAMAM blocks according to reported procedure in literature [2] (scheme 1).

Preparation of ABA type linear-dendritic copolymers containing PEG as B block and PAMAM with aromatic functional groups as A blocks (LDAr)

In order to synthesis LDAr, ligand (2- chloro 4,6- di phenoxy- 1، 3,5- triazine) (compound A) was synthesized by using reaction between cyanuric chloride and phenol in the presence of sodium hydroxide according to reported procedures in literature [3].

Then a solution of $LDNH_2$ (2 g) in 5 mL of dry methanol was added to a solution of compound A (1.82 g) in 10 mL of dry dichloromethane, dropwise at 0 ºC. Mixture was stirred at room temperature for 1 h and then was refluxed for additional 12 h. Mixture was cooled

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and filtered off and product was dissolved in 5 mL methanol and then it was precipitated in diethyl ether. Purified compound was obtained as a dark brown viscose solid. (scheme 2).

Preparation of palladium complex of LDAr (LDAr-Pd)

For preparation of these linear-dendritic copolymers, first was synthesized of $Pd(CH_3CN)_2Cl_2$ complex. Therefore 0.1g (0.56 mmol) of $PdCl_2$ with 35ml acetonitril was refluxed for 1 h was cooled and solution was obtained as a orange solution. Then insitu added to 1.2g (1.1mmol) LDAr. Mixture was stirred at room temperature for 24 h then was filtered off. The crude precipitation was washed in acetonitril for several times. Purified compound was obtained as a yellow solid. (scheme 3).

Preparation of Pd bis [(2- chloro 4,6 di naphtoxy- 1،3,5- triazine)]$_2Cl_2$ (Ligand X).

First ligand 2-chloro-4,6-di naphtoxy-1،3,5- triazine (compound B) was synthesized by using reported procedure in literature [3]. $Pd(CH_3CN)_2Cl_2$ was added to 0.36 g (1.1 mmol) of compound B and mixture was stirred at room temperature for 24 h and then it was filtered off. Crude product was washed by acetonitril several times and final product was obtained as a light brown solid.

Preparation of LDCNTs

For preparation of LDCNTs ,0.1 g of opened CNT was added to an aqueous solution of LDAr (0.1 g in 10 ml water) or LDAr-Pd and it was sonicated for 5 minutes at room temperature. Then solution was stirred at room temperature over night. The solution was filtered and centrifuged to precipitate the final product.

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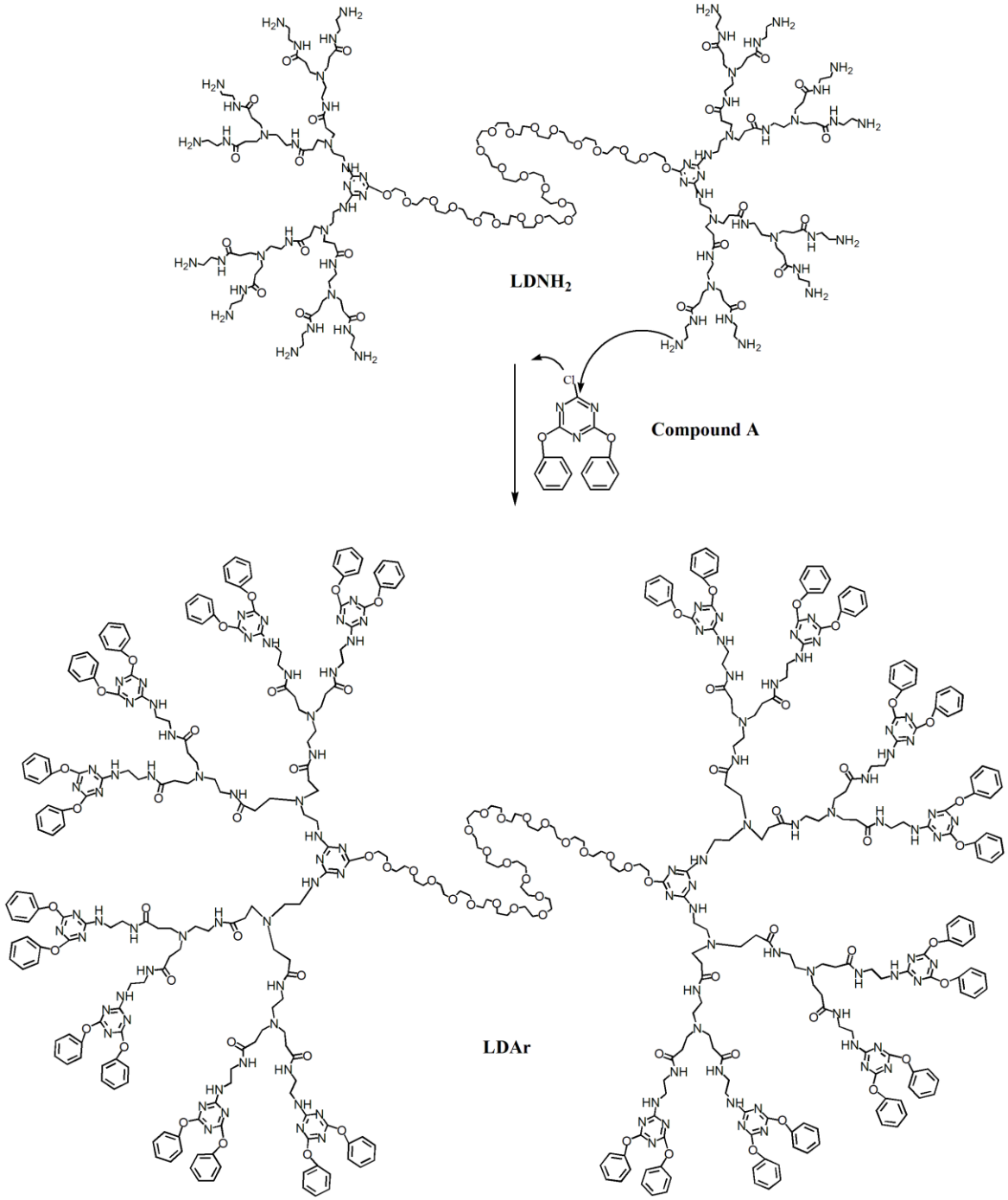

Scheme SI1. ABA type linear-dendritic copolymers containing periphery a) amino and b) aromatic groups.

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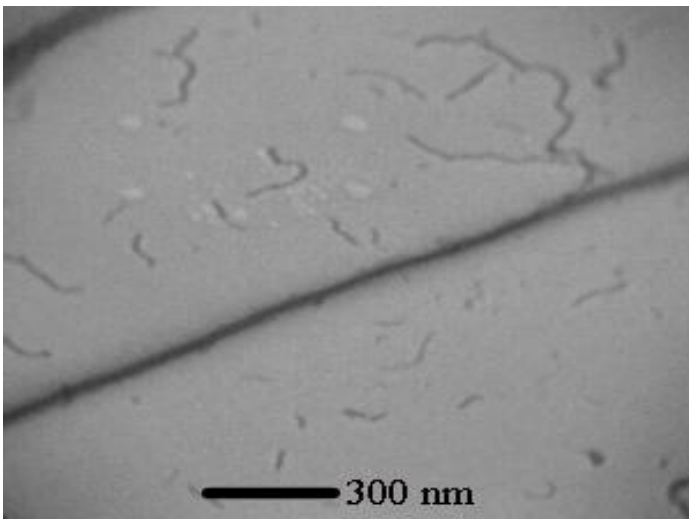

Figure SI1. TEM image of pristine MWCNTs after refluxing in acid and purification process (SCNTs).

SEM images show a network-like assembly for SCNTs interacted with the $LDNH_2$. Diameter of SCNTs shielded by linear-dendritic copolymers is around 50 nm. Since diameter of pristine SCNTs is 25-30 nm, diameter of assembled linear-dendritic copolymers onto the surface of carbon nanotubes is 25 nm.

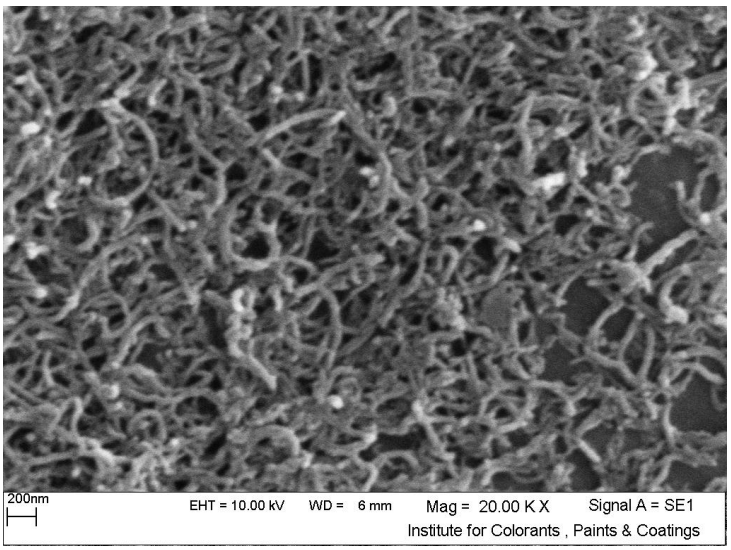

Figure SI2. SEM images of SCNTs interacted with $LDNH_2$ noncovalently.

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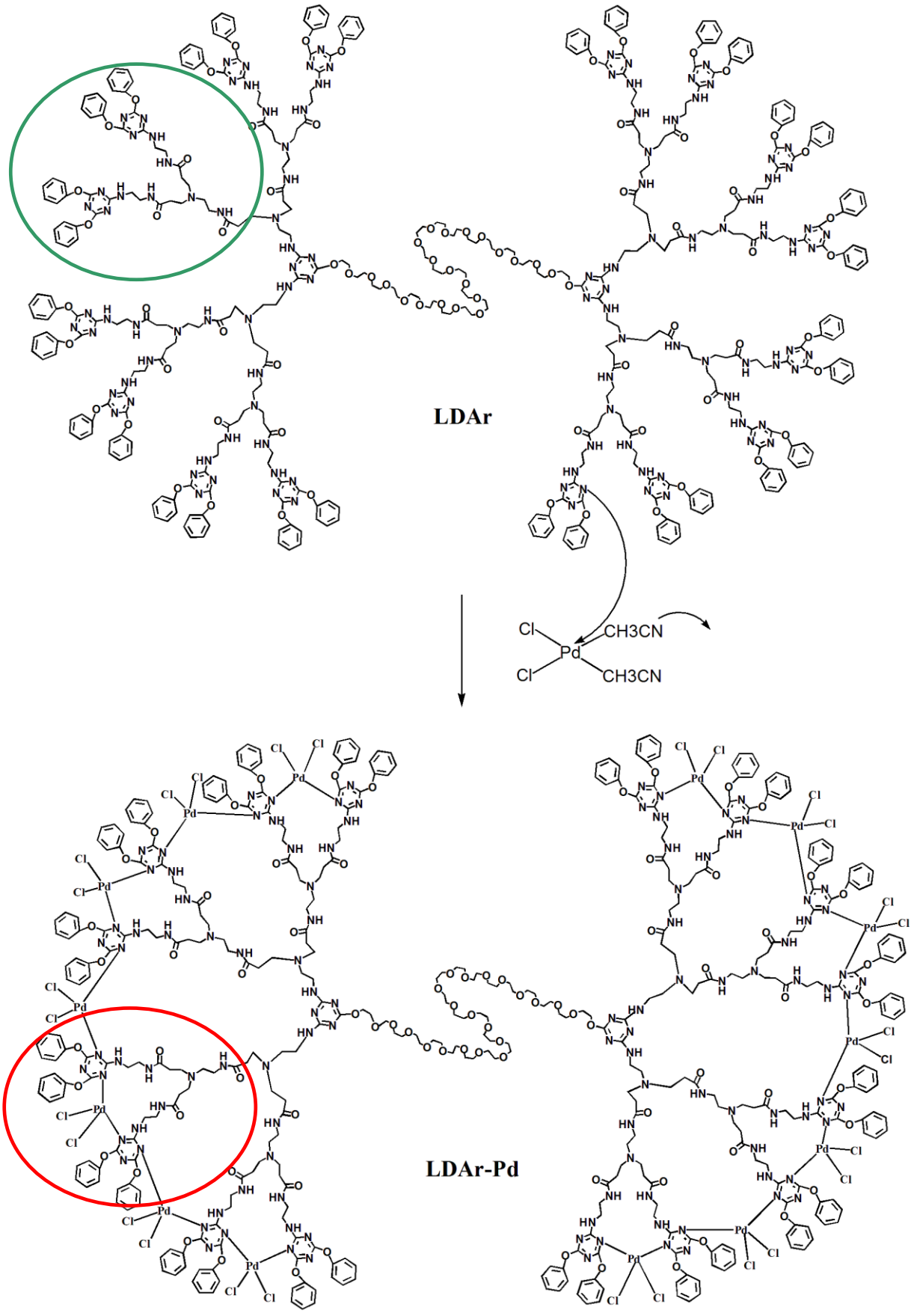

Scheme SI2. Reaction between hetero atoms of dendritic blocks of LDAr and palladium chloride to produce a complex with planar and rigid aromatic domains.

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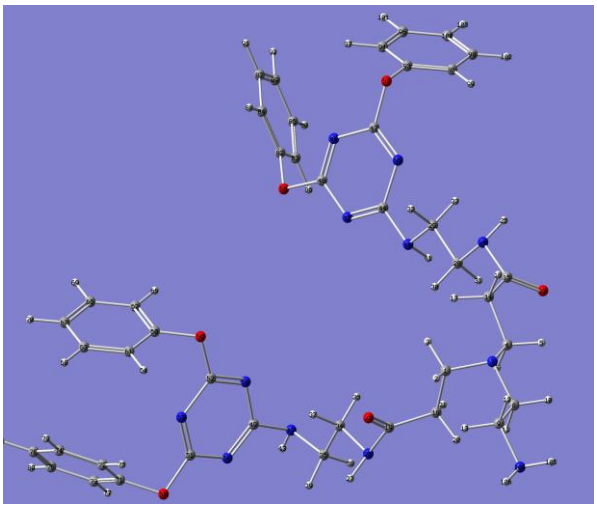
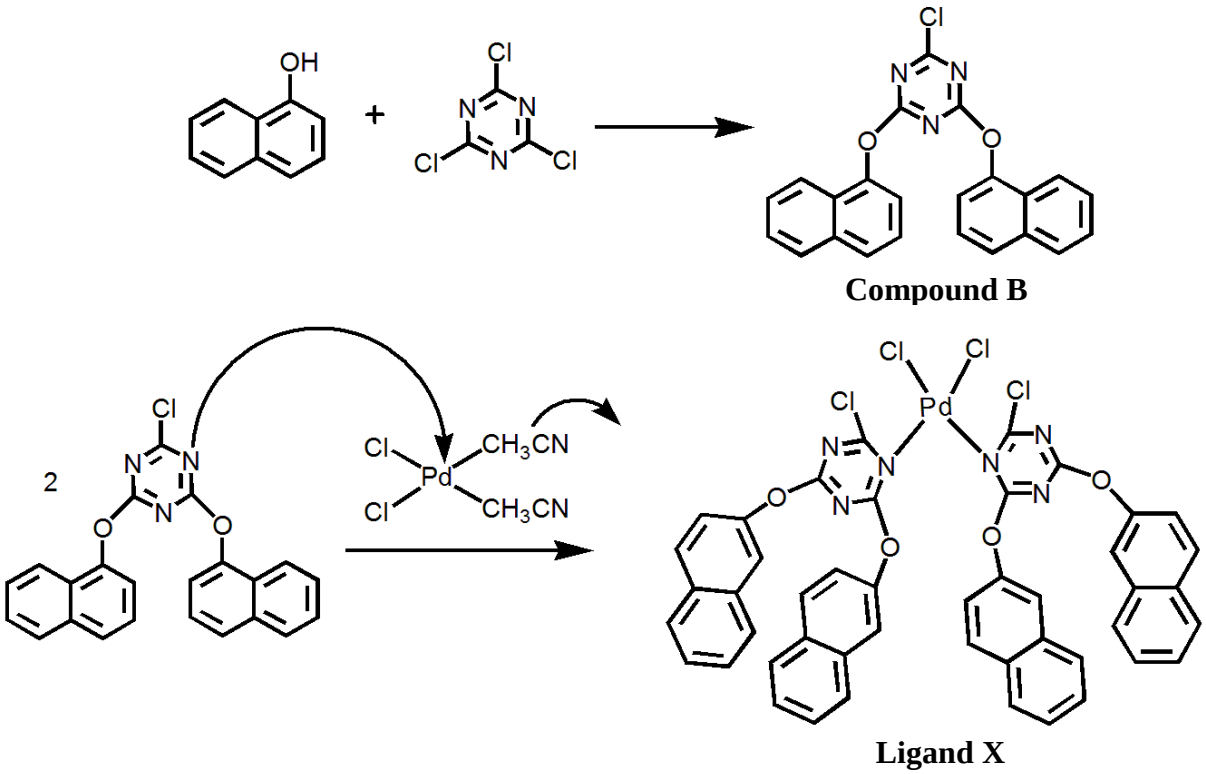


Figure SI3. Three dimensional structure for highlighted part of LDAr in scheme SI2 (green circle).



Scheme 3. Synthesis of palladium complex of 2-chloro 4,6-di Naphtoxy-1,3,5-triazine.

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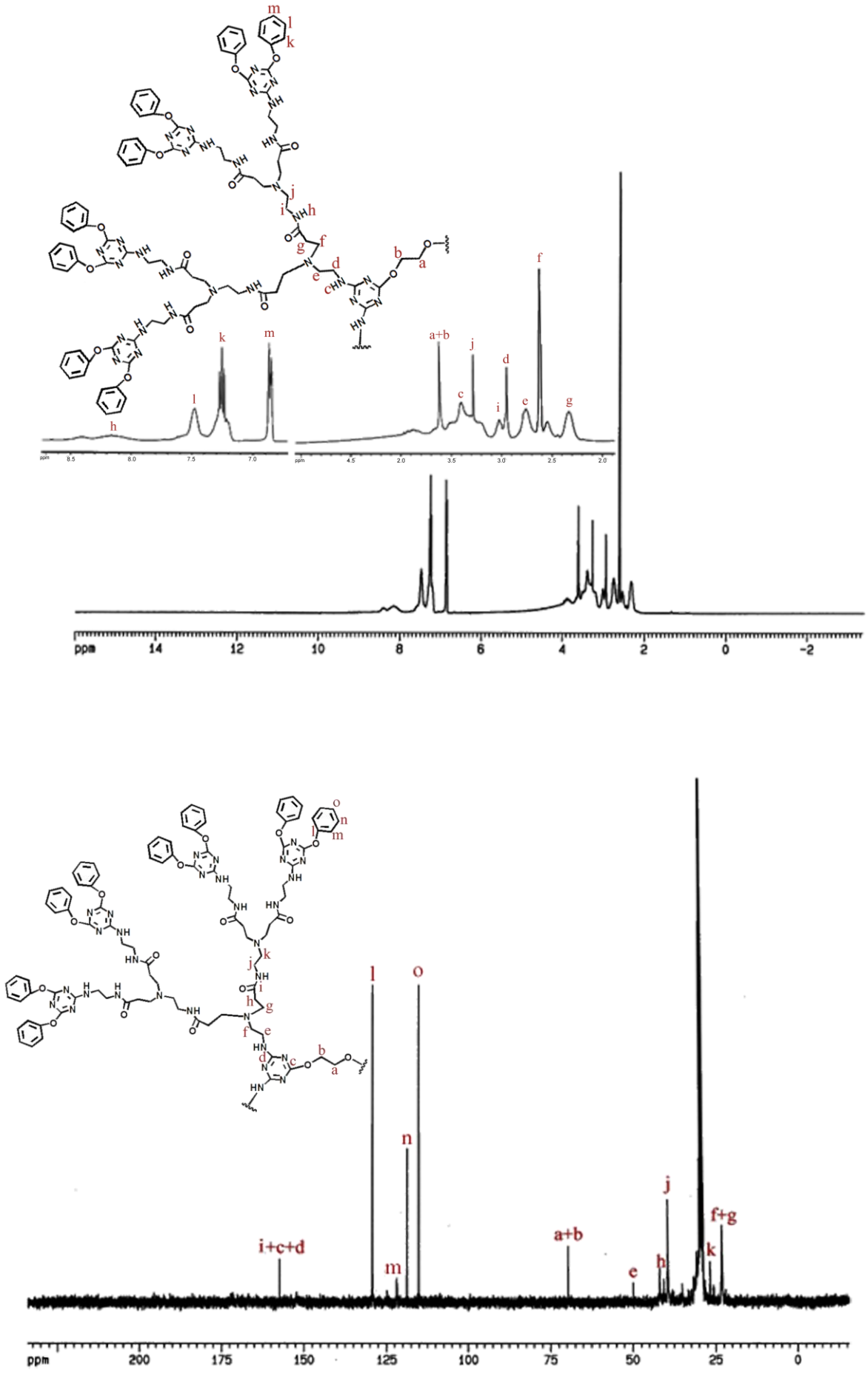

Figure SI4. ^{1}H, ^{13}C NMR spectra of LDAr.

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The integral ratio of aliphatic protons of PEG to the aromatic part of the LDAr is 1.8 (in comparison to 1.7 as a theoretical calculation). This is an evidence, which shows growth of linear-dendritic copolymer has been accomplished completely (Figure SI6).

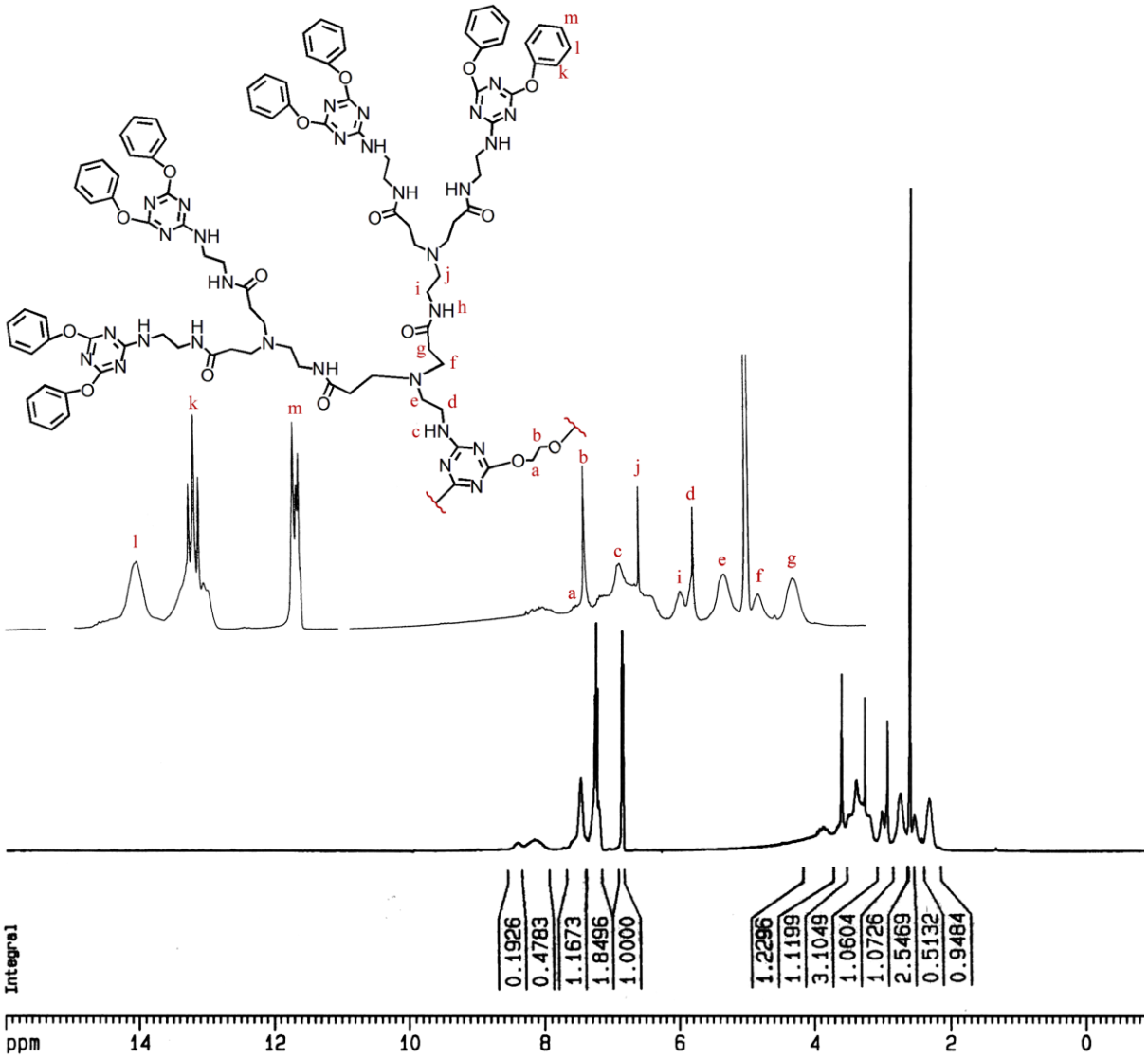

Figure SI5. The integral ratio of protons of polyethylene glycol to aromatic end groups is in agree with the calculated ratio.

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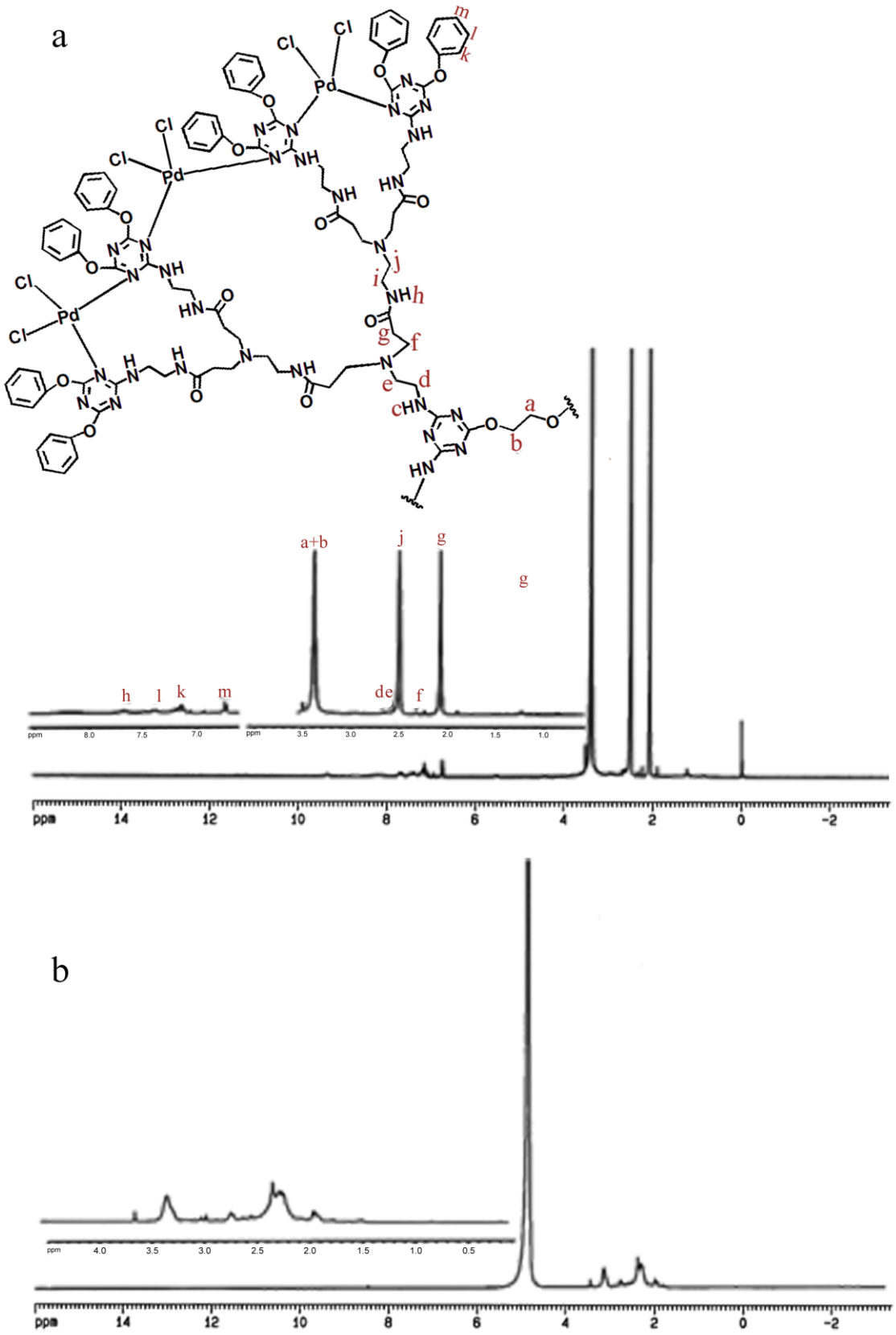

Figure SI6. ^{1}H NMR spectra of a) LDAr b) LDAr-Pd/CNT (LDCNTs).

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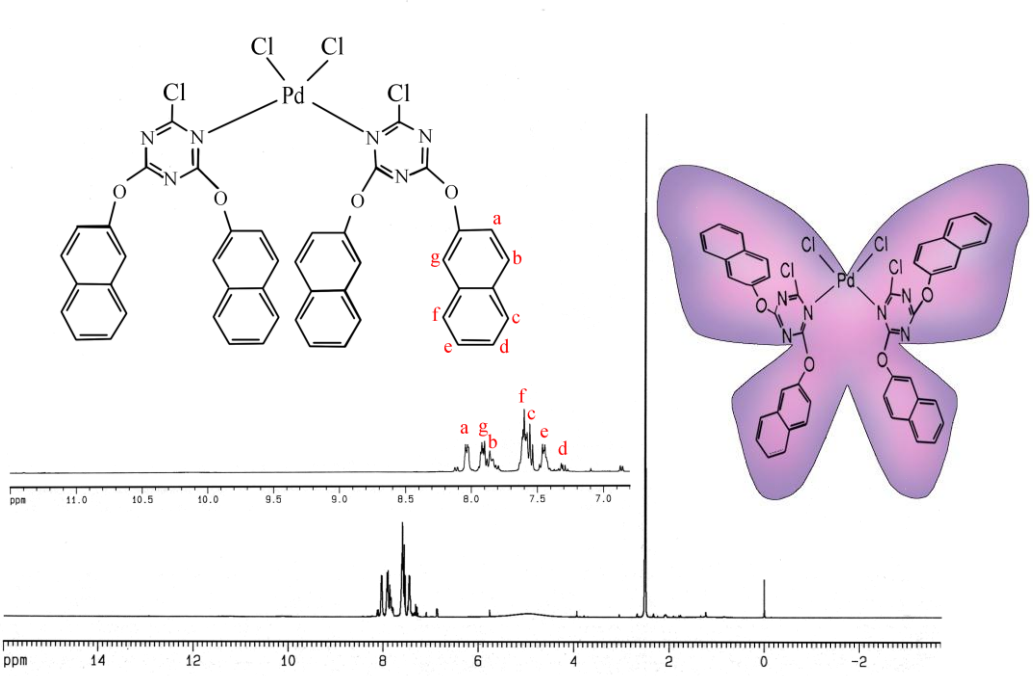

Figure SI7. ^{1}H NMR spectra of Ligand X.

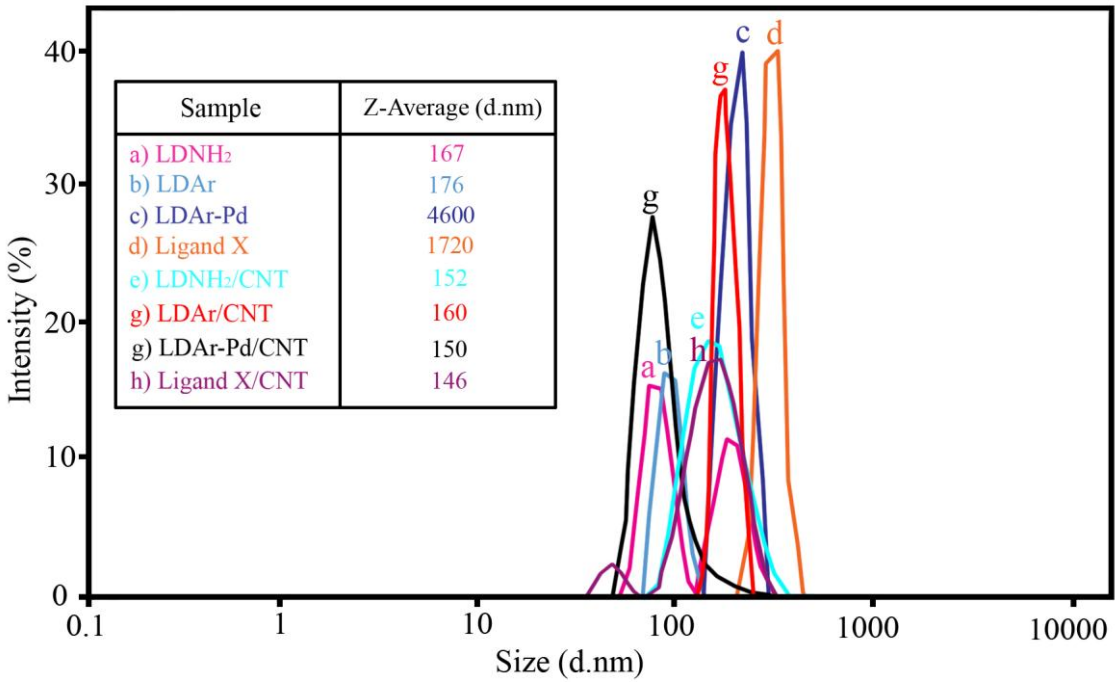

Figure SI8. DLS diagrams of ligands and linear-dendritic copolymers used in this research work.

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Sample	Zeta Potential(mV)
LDAr-Pd	-0.941
Ligand X	-0.557
LDAr-Pd/CNT	-6.21
Ligand X/CNT	-7.01

Figure SI9. Zeta potential of LDAr-Pd, ligand X, LDAr-Pd/CNT, Ligand X/CNT.

References:

[1] Adeli, M.; Bahari, A.; Hekmatara, H. *NANO: Brief Reports and Reviews.* **2008**, 3, 37-44.

[2] Kim, T.; See, H.; Ch. J.; Jang, H-S.; et al. *Biomacromolecules.* **2004,** 5, 2487-2492.

[3] Namazi, H.; Adeli, M. *polymer*. **2005**, 46, 10788–10799.