Supporting Information

Structurally Diverse Nitric Oxide-Releasing Poly(propylene Imine) Dendrimers

Yuan Lu,[†] Bin Sun,[†] Chenghong Li and Mark H. Schoenfisch[*]

† *Co-first authors, contributing equally to this work*
* *Department of Chemistry, University of North Carolina – Chapel Hill, Chapel Hill, NC 27599; Email: schoenfisch@unc.edu*

Synthesis of G0.5-PPI-CN to G4.5-PPI-CN. For the synthesis of G0.5-PPI-CN, ethylenediamine (EDA, 25.0 mL, 0.374 mol) and deionized water (263 mL) were placed in a 1000 mL round-bottomed flask. Acrylonitrile (ACN, 140 mL) was added in portions of 20 mL with stirring for 15 minutes. The resulting mixture was refluxed for 2 hrs, and then cooled to room temperature overnight. ACN was removed in vacuo at 40 °C. G0.5-PPI-CN was crystallized from the mixture and isolated by vacuum filtration. The crude product was recrystallized from THF/methanol as a white power. Representative ^{1}HNMR data: (300 MHz, $CDCl_3$): δ (ppm) 2.55 (8H, -NCH_2CH_2CN), 2.77 (4H, -NCH_2CH_2N-), 2.96 (t, 8H, -NCH_2CH_2CN). Synthesis of higher generation PPI-CN (e.g., from G1.5 to G4.5) was not significantly different from the synthesis of G0.5-PPI-CN as described above, with the exception that PPI-CN (e.g., from G1.5 to G4.5) are usually viscous liquid and their purification processes would normally require the use of preparative-scale chromatography. As a result, the synthesis of higher generation PPI-CN was conducted in a slightly different manner. Higher generation PPI-CN (10.0 g) (e.g., from G1.5 to G4.5) was dissolved in deionized water (50 mL) and THF (100

mL). To this solution was added ACN (50 mL). If phase separation of the resulting solution occurs, an additional amount of THF was added. The reaction mixture was stirred at room temperature for 3 days and a small amount was removed for analysis by ^{1}H NMR spectroscopy to determine the extent of reaction. If the reaction is not complete, an additional amount of ACN (25 mL) was added and the reaction was stirred for two to three extra days.

Synthesis of G1-PPI-NH_2 to G5-PPI-NH_2. For the synthesis of G1-PPI-NH_2, sponge cobalt catalyst (5.0-6.0 g) was washed with 10% KOH solution for 10 minutes, three times with de-ionized water, and twice with methanol prior to use. G0.5-PPI-CN (10.0 g) was placed in a glass reactor sleeve and dissolved in THF (70 mL) and methanol (30 mL). To this solution, the sponge cobalt catalyst prepared as described above (5.0-6.0 g) was added using a pipet and the reactor sleeve was placed in the hydrogenation chamber with proper stirring. The reactor was purged with house nitrogen (60 PSI) for five times, and then with hydrogen (400 PSI) for two times. The reactor was charged with hydrogen to a pressure of 800 PSI, and heated to 100°C. The hydrogen gas pressure was maintained at 1000 PSI throughout the reaction. After 3 hours, the reaction mixture was allowed to cool down to room temperature. Hydrogen remained in the reactor was slowly removed, and the reaction chamber was purged once with house nitrogen. The resulting reaction mixture was then filtered to remove the cobalt catalyst, and solvent was removed in vacuo. The final product was dried under vacuum overnight to yield G1-PPI-NH_2 as a colorless liquid. Representative ^{1}HNMR data: (300 MHz, $CDCl_3$): δ (ppm) 1.52 (q, 8H, $NH_2CH_2C\mathit{H}_2CH_2N$-), 2.40 (t, 8H, $NH_2CH_2CH_2C\mathit{H}_2N$-), 2.44 (s, 4H, -$NC\mathit{H}_2C\mathit{H}_2N$-), 2.64 (t, 8H, $NH_2C\mathit{H}_2CH_2CH_2N$-). The approach to synthesis of higher generation PPI-NH_2 (e.g., from G2 to G5) was similar to that of G1-PPI-NH_2 with the exception that a mixture of EDA and THF

(50:50, v/v) was used as a solvent and was removed after reaction in vacuo using 1-butanol as an azeotropic agent to assist the removal of high boiling point solvent (e.g., EDA). The resulting higher generation PPI-NH_2 (e.g., from G2 to G5) was dried under vacuum overnight to yield as a light yellow liquid. Calculated mass is 745.23, 1658.74, 3485.76, and 7139.80 for G2-PPI-NH_2, G3-PPI-NH_2, G4-PPI-NH_2, and G5-PPI-NH_2. Mass found by ESI-MS is 744.73, 1657.64, 3483.45, and 7142.4, respectively.