Electronic Supplementary Material (ESI) for Materials Advances.

Supporting Information

Fabrication of polydiacetylene particles using a solvent injection method

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Nuclear magnetic resonance (NMR). ^{1}H Quantitative NMR analysis was conducted using a Bruker Avance III 400 spectrometer (^{1}H, 400.14 MHz) equipped with a 5 mm BBFO probe, with the aim to quantify the amount of residual solvent in the diacetylene solution. The 400 MHz ^{1}H QNMR acquisition parameters were: 9009 Hz spectral width, 65536 point FID size, 3300 Hz offset, 60 s recycle delay. Ethanol quantification was performed using an external reference of known concentration and calculated using the Eretic2 module in the Bruker Topspin version 3.6.1 software. Samples were prepared and analyzed in D_2O and all chemical shifts were quoted relative to the residual HOD peak, assigned to 4.7 ppm. Based on QNMR analysis, the residual ethanol is determined to be 1% and we showed that this does not impact the performance of PDA for ammonia detection (Figure 6). This is in agreement with a previous report that demonstrates the ability of PDA to detect analytes in the presence of ethanol with up to 13%.[1]

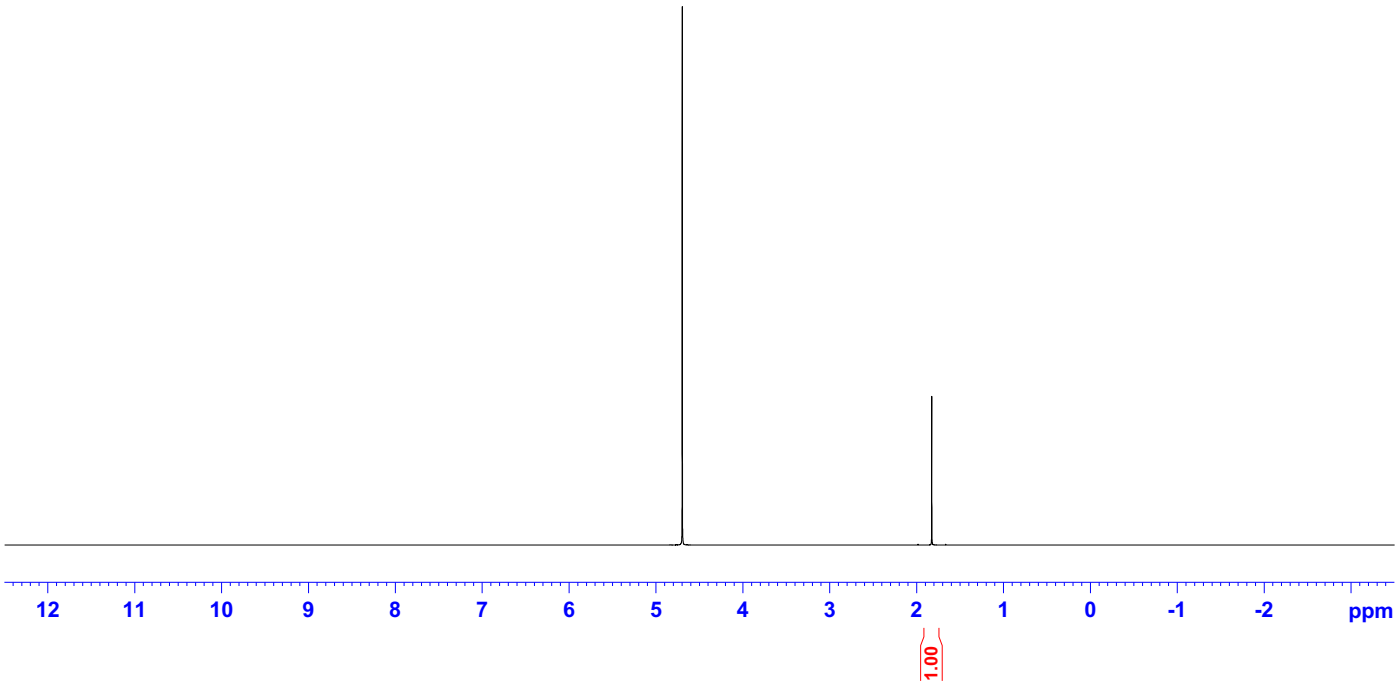


Figure S1: 400 MHz ^{1}H NMR spectrum of sodium acetate trihydrate (99.7%, 13.29 mg) in D_2O (1099 mg). Resonance from residual ^{1}H in water (δ 4.8 ppm) is used to reference the ^{1}H spectrum to a methyl resonance of TMS at 0.0 ppm. The resonance of the acetate methyl group from the sodium acetate (trihydrate) was observed at δ 1.9 ppm.

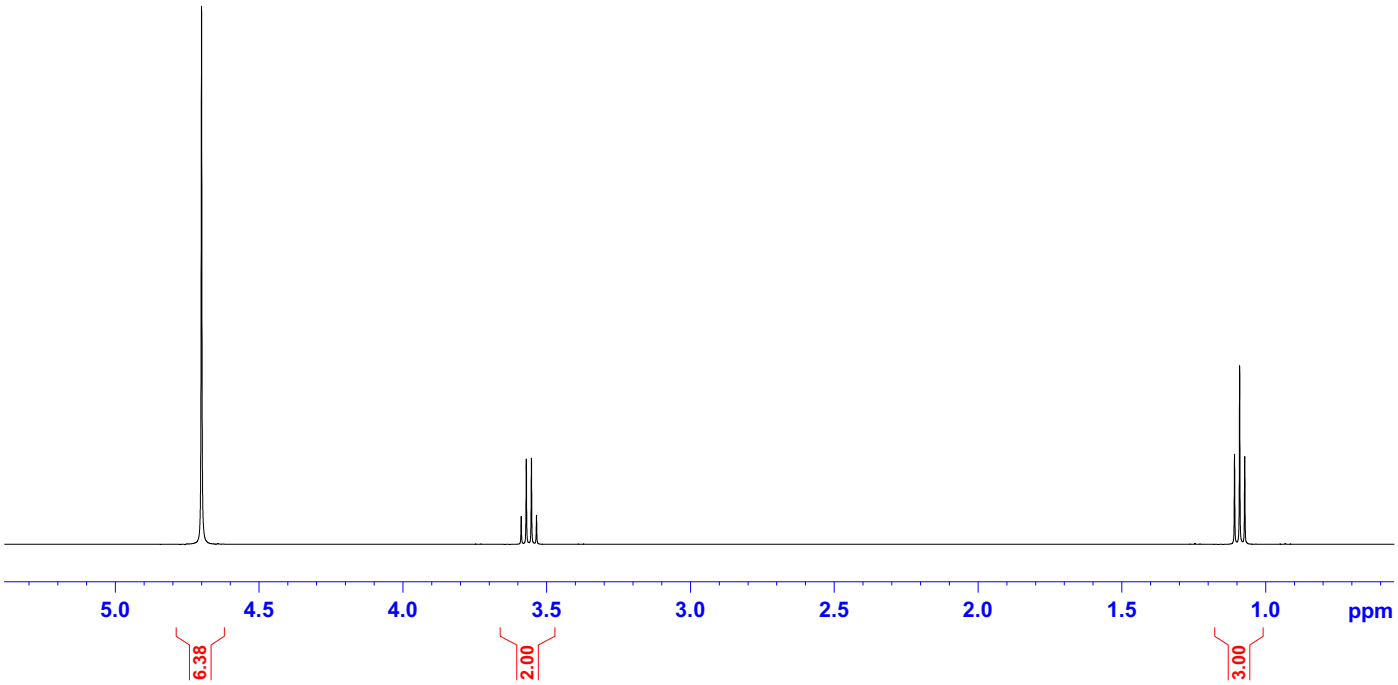


Figure S2: 400 MHz ^{1}H NMR spectrum of sample PCDA in D_2O. The resonance of the methyl and methylene group from ethanol were observed at δ 1.2 and δ 3.6 ppm, respectively.

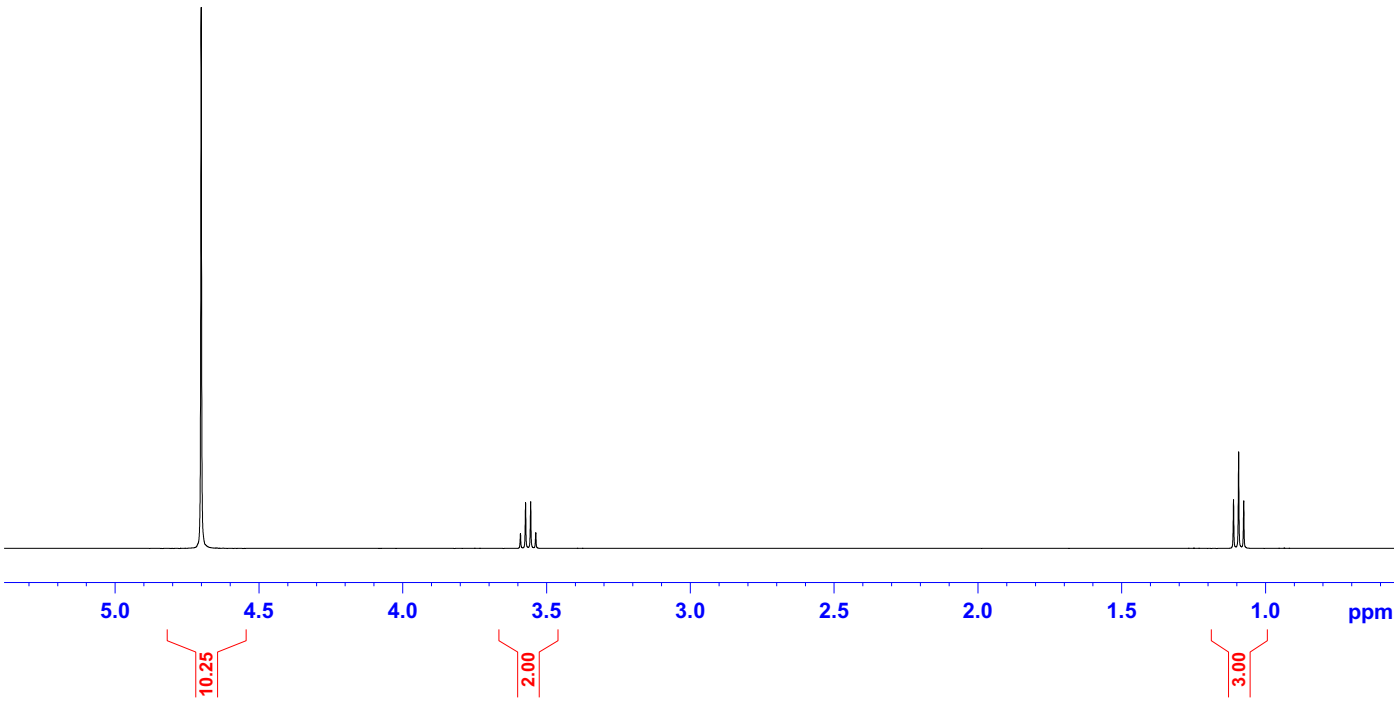


Figure S3: 400 MHz ^{1}H NMR spectrum of sample TCDA in D_2O. The resonance of the methyl and methylene group from ethanol were observed at δ 1.2 and δ 3.6 ppm, respectively.

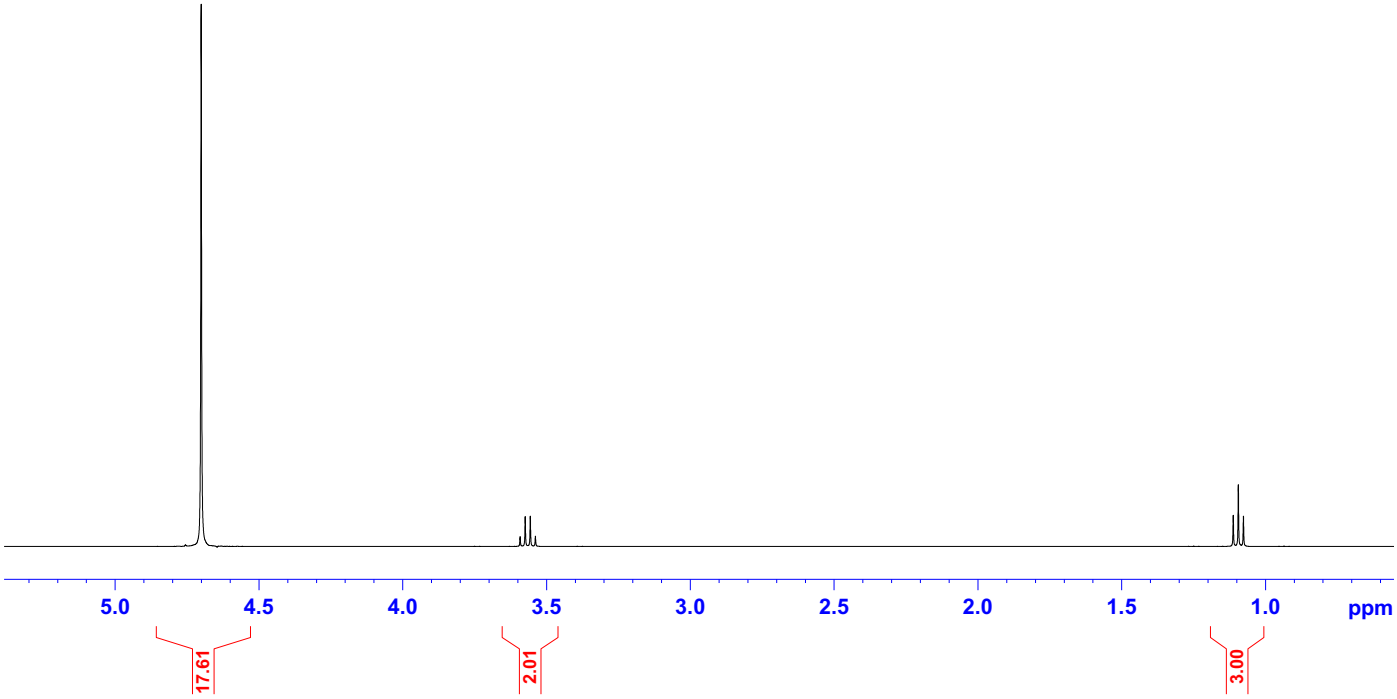
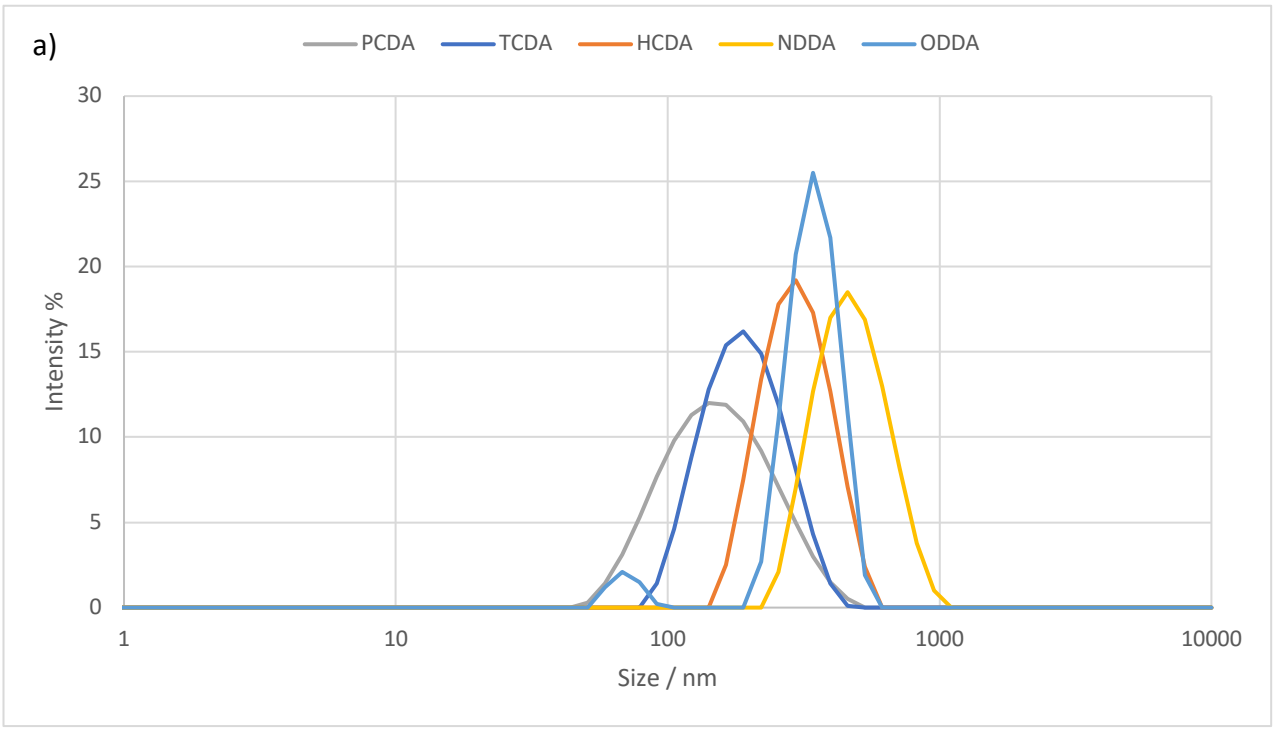


Figure S4: 400 MHz ^{1}H NMR spectrum of sample HCDA in D_2O. The resonance of the methyl and methylene group from ethanol were observed at δ 1.2 and δ 3.6 ppm, respectively.



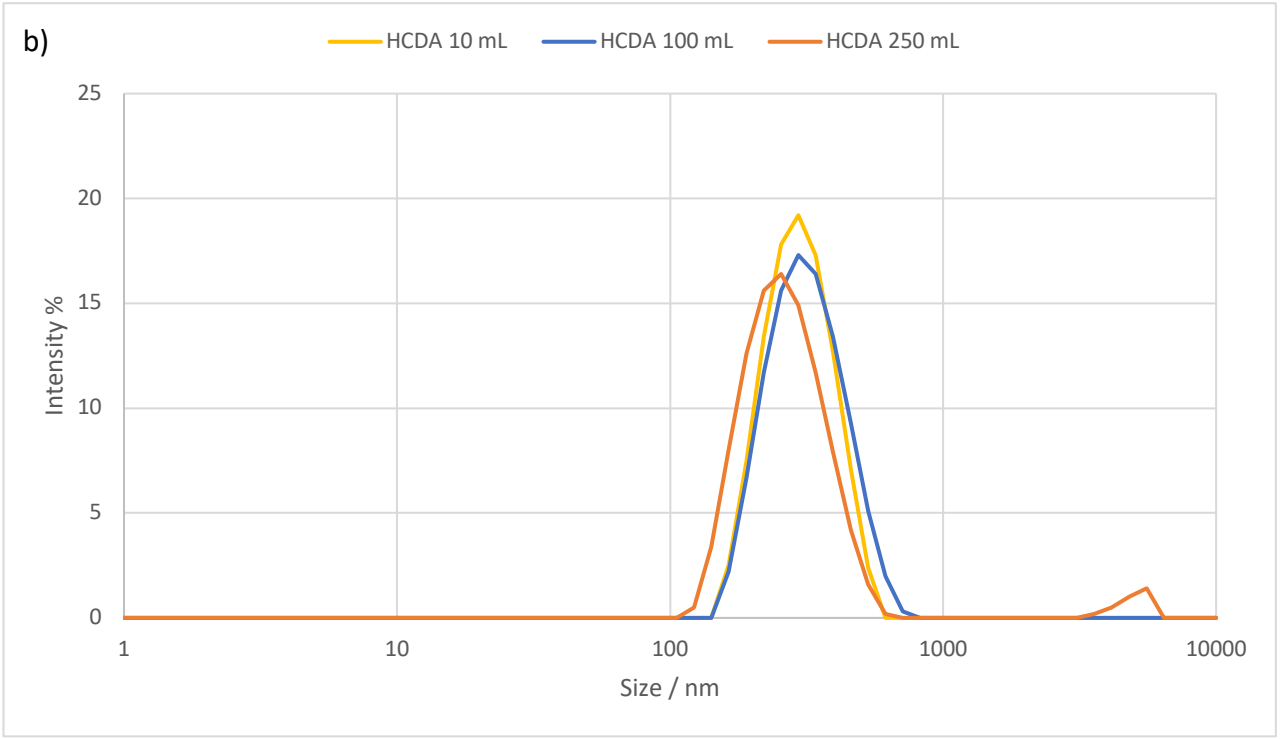


Figure S5: Intensity size distribution of a) PDA particles synthesized from 5 diacetylene monomers using the solvent injection method and b) PDA composed of HCDA formed at 10, 100, and 250 mL scale.

Table S1: Size (from the intensity plot) and surface charge of PDA particles formed using the solvent injection method, directly after synthesis and after four months of storage. Negligible change in size distribution and zeta potential of the PDA vesicles was observed, demonstrating the long-term stability of the PDA vesicles formed via the solvent injection method.

Monomers	Time since synthesis	Diameter (nm)	PDI	Zeta potential (mV)
PCDA (25C)	Fresh	127.2 ± 58.3	0.129 ± 0.049	-32.2 ± 8.6
	After four months	138.8 ± 51.6	0.091 ± 0.030	-31.0 ± 8.2
TCDA (23C)	Fresh	184.1 ± 59.9	0.068 ± 0.024	-29.0 ± 6.8
	After four months	213.8 ± 85.9	0.115 ± 0.017	-29.0 ± 8.5
HCDA (21C)	Fresh	281.9 ± 91.3	0.072 ± 0.027	-26.7 ± 6.7
	After four months	252.7 ± 80.1	0.073 ± 0.021	-25.7 ± 7.8

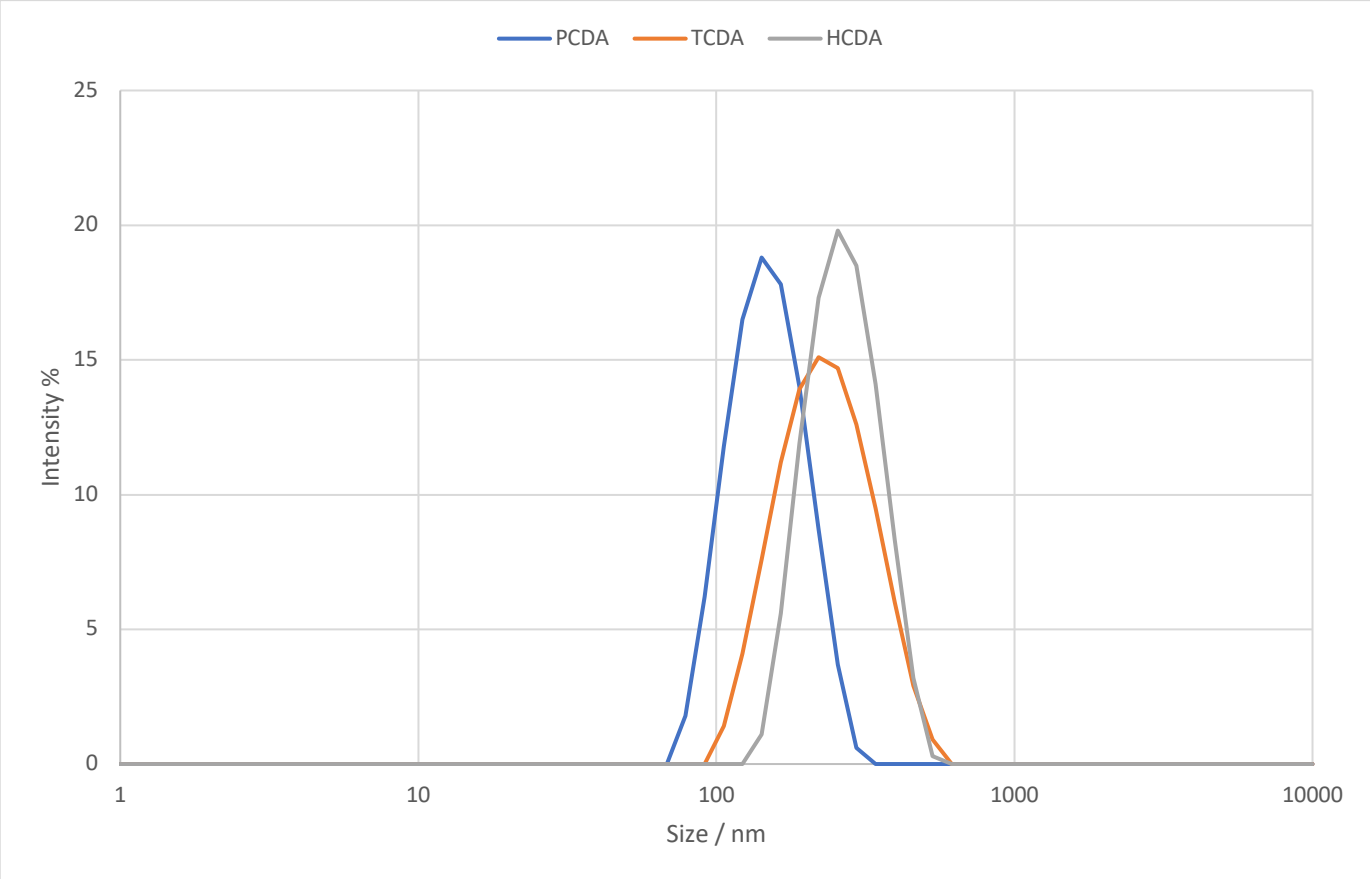


Figure S6: Intensity size distribution of PDA particles synthesized from 3 diacetylene monomers using the solvent injection method after four months of storage.

References

1. M. J. Shin and J . S. Shin, *J. Appl. Polym. Sci.*, 2020, **136**, 47688.