Electronic Supplementary Information

Assembly of single-stranded polydeoxyadenylic acid and β-glucan probed by the sensing platform of graphene oxide based on the fluorescence resonance energy transfer and fluorescence anisotropy

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1 Supplementary figures

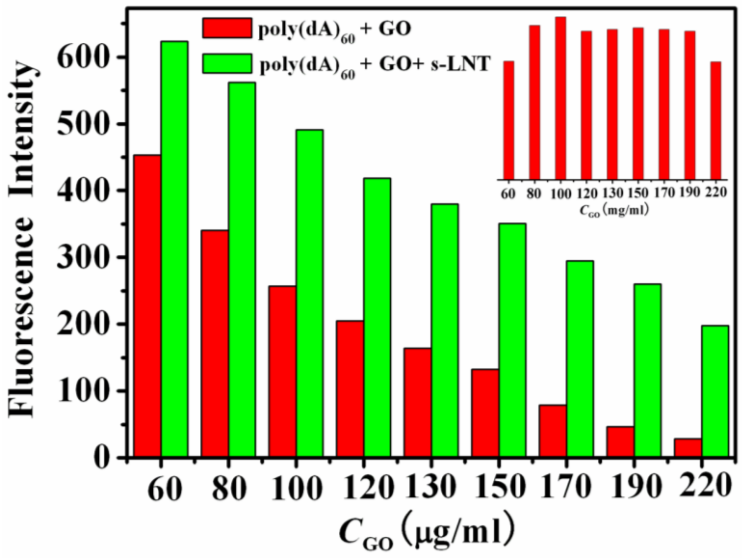

Fig. S-1 Fluorescence intensity histogram of poly(dA)$_{60}$ + GO and poly(dA)$_{60}$ + GO + s-LNT in the presence of different concentrations of GO. ([poly(dA)$_{60}$]=50 nM; [s-LNT]=100 μg/mL; λ_{ex} = 480 nm; λ_{em} = 517 nm). Inset: the difference value of fluorescence intensity between poly(dA)$_{60}$ + GO and poly(dA)$_{60}$ + GO + s-LNT at each case.

2 Raw data of fluorescence anisotropy

Table 1. Poly (dA) only.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	371.112	318.035	1	0.053	4mU read method
8.6	1	10	10	480	517	1	372.26	318.014	1	0.054	4mU read method
17.2	1	10	10	480	517	1	371.665	317.087	1	0.054	4mU read method
25.8	1	10	10	480	517	1	371.725	316.922	1	0.054	4mU read method
34.4	1	10	10	480	517	1	372.328	316.711	1	0.055	4mU read method
43	1	10	10	480	517	1	371.846	317.284	1	0.054	4mU read method
51.6	1	10	10	480	517	1	371.15	317.559	1	0.053	4mU read method
60.2	1	10	10	480	517	1	371.394	317.444	1	0.054	4mU read method
68.9	1	10	10	480	517	1	370.738	317.11	1	0.053	4mU read method
77.4	1	10	10	480	517	1	371.276	317.482	1	0.053	4mU read method
86	1	10	10	480	517	1	370.855	317.527	1	0.053	4mU read method

94.6	1	10	10	480	517	1	371.13	316.668	1	0.054	4mU read method
103.2	1	10	10	480	517	1	371.802	317.631	1	0.054	4mU read method
111.7	1	10	10	480	517	1	370.123	316.925	1	0.053	4mU read method
120.4	1	10	10	480	517	1	371.271	316.83	1	0.054	4mU read method
129	1	10	10	480	517	1	369.959	316.92	1	0.053	4mU read method
137.5	1	10	10	480	517	1	370.78	316.881	1	0.054	4mU read method
146.2	1	10	10	480	517	1	370.77	316.261	1	0.054	4mU read method
154.7	1	10	10	480	517	1	370.934	317.776	1	0.053	4mU read method
163.3	1	10	10	480	517	1	370.092	316.903	1	0.053	4mU read method
172	1	10	10	480	517	1	370.525	316.126	1	0.054	4mU read method
180.5	1	10	10	480	517	1	370.184	316.475	1	0.054	4mU read method
189.1	1	10	10	480	517	1	370.563	315.844	1	0.055	4mU read method
197.7	1	10	10	480	517	1	370.644	315.48	1	0.055	4mU read method
206.3	1	10	10	480	517	1	369.869	316.298	1	0.053	4mU read method
215	1	10	10	480	517	1	370.282	316.169	1	0.054	4mU read method
223.6	1	10	10	480	517	1	371.547	315.677	1	0.056	4mU read method
232.2	1	10	10	480	517	1	369.622	315.73	1	0.054	4mU read method
240.8	1	10	10	480	517	1	370.378	316.22	1	0.054	4mU read method
249.4	1	10	10	480	517	1	370.923	315.599	1	0.055	4mU read method
258	1	10	10	480	517	1	370.114	316.597	1	0.053	4mU read method
266.5	1	10	10	480	517	1	370.497	316.562	1	0.054	4mU read method
275.2	1	10	10	480	517	1	370.129	317	1	0.053	4mU read method
283.7	1	10	10	480	517	1	369.348	316.796	1	0.052	4mU read method

Table 2. Poly (dA) + GO.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	151.613	99.066	1	0.15	4mU read method
8.6	1	10	10	480	517	1	151.924	99.579	1	0.149	4mU read method
17.1	1	10	10	480	517	1	152.754	99.03	1	0.153	4mU read method
25.7	1	10	10	480	517	1	153.758	99.395	1	0.154	4mU read method
34.2	1	10	10	480	517	1	153.196	99.021	1	0.154	4mU read method
42.8	1	10	10	480	517	1	152.919	99.002	1	0.154	4mU read method
51.4	1	10	10	480	517	1	152.34	99.682	1	0.15	4mU read method
59.9	1	10	10	480	517	1	153.216	99.33	1	0.153	4mU read method
68.5	1	10	10	480	517	1	153.689	99.881	1	0.152	4mU read method
77	1	10	10	480	517	1	152.325	99.929	1	0.149	4mU read method
85.6	1	10	10	480	517	1	152.912	100.186	1	0.149	4mU read method
94.2	1	10	10	480	517	1	152.577	99.688	1	0.15	4mU read method
102.7	1	10	10	480	517	1	152.741	99.072	1	0.153	4mU read method
111.3	1	10	10	480	517	1	152.169	99.823	1	0.149	4mU read method
119.9	1	10	10	480	517	1	152.448	99.439	1	0.151	4mU read method

128.4	1	10	10	480	517	1	152.406	99.628	1	0.15	4mU read method
137	1	10	10	480	517	1	152.606	99.258	1	0.152	4mU read method
145.5	1	10	10	480	517	1	151.986	98.817	1	0.152	4mU read method
154.1	1	10	10	480	517	1	151.691	99.804	1	0.148	4mU read method
162.7	1	10	10	480	517	1	152.264	98.704	1	0.153	4mU read method
171.2	1	10	10	480	517	1	152.465	98.493	1	0.154	4mU read method
179.8	1	10	10	480	517	1	151.603	99.654	1	0.148	4mU read method
188.3	1	10	10	480	517	1	150.963	98.817	1	0.15	4mU read method
196.9	1	10	10	480	517	1	151.79	99.477	1	0.149	4mU read method
205.5	1	10	10	480	517	1	152.059	99.09	1	0.151	4mU read method
214	1	10	10	480	517	1	151.282	98.929	1	0.15	4mU read method
222.6	1	10	10	480	517	1	151.185	98.347	1	0.152	4mU read method
231.1	1	10	10	480	517	1	151.028	98.181	1	0.152	4mU read method
239.7	1	10	10	480	517	1	150.966	99.201	1	0.148	4mU read method
248.3	1	10	10	480	517	1	150.952	98.68	1	0.15	4mU read method

Table 3. Poly (dA) + GO + s-LNT.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	411.569	272.143	1	0.146	4mU read method
8.5	1	10	10	480	517	1	412.798	272.178	1	0.147	4mU read method
17.1	1	10	10	480	517	1	414.93	274.332	1	0.146	4mU read method
25.6	1	10	10	480	517	1	415.671	274.358	1	0.147	4mU read method
34.2	1	10	10	480	517	1	416.566	273.541	1	0.148	4mU read method
42.8	1	10	10	480	517	1	416.344	274.345	1	0.147	4mU read method
51.4	1	10	10	480	517	1	419.159	275.547	1	0.148	4mU read method
60	1	10	10	480	517	1	418.351	275.295	1	0.148	4mU read method
68.5	1	10	10	480	517	1	420.011	275.684	1	0.149	4mU read method
77.1	1	10	10	480	517	1	423.056	276.501	1	0.15	4mU read method
85.7	1	10	10	480	517	1	422.414	277.077	1	0.149	4mU read method
94.3	1	10	10	480	517	1	423.964	278.259	1	0.149	4mU read method
102.8	1	10	10	480	517	1	424.417	277.752	1	0.15	4mU read method
111.4	1	10	10	480	517	1	424.099	278.346	1	0.149	4mU read method
120	1	10	10	480	517	1	423.662	279.626	1	0.147	4mU read method
128.6	1	10	10	480	517	1	425.667	279.59	1	0.148	4mU read method
137.2	1	10	10	480	517	1	425.441	280.024	1	0.148	4mU read method
145.8	1	10	10	480	517	1	425.11	281.323	1	0.146	4mU read method
154.3	1	10	10	480	517	1	425.855	279.898	1	0.148	4mU read method
162.9	1	10	10	480	517	1	425.039	279.633	1	0.148	4mU read method
171.5	1	10	10	480	517	1	426.093	281.012	1	0.147	4mU read method
180.1	1	10	10	480	517	1	425.368	281.187	1	0.146	4mU read method
188.6	1	10	10	480	517	1	427.329	281.444	1	0.147	4mU read method

197.2	1	10	10	480	517	1	426.511	281.695	1	0.146	4mU read method
205.8	1	10	10	480	517	1	428.492	282.126	1	0.147	4mU read method
214.4	1	10	10	480	517	1	429.693	281.299	1	0.15	4mU read method
223	1	10	10	480	517	1	427.824	282.789	1	0.146	4mU read method
231.5	1	10	10	480	517	1	428.35	282.312	1	0.147	4mU read method
240.1	1	10	10	480	517	1	428.48	283.231	1	0.146	4mU read method
248.7	1	10	10	480	517	1	430.444	284.102	1	0.147	4mU read method
257.3	1	10	10	480	517	1	429.607	281.431	1	0.149	4mU read method
265.8	1	10	10	480	517	1	429.576	284.044	1	0.146	4mU read method
274.4	1	10	10	480	517	1	430.214	282.943	1	0.148	4mU read method

Table 4. Poly (dA) + s-LNT.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	932.88	661.345	1	0.136	4mU read method
8.6	1	10	10	480	517	1	939.681	664.708	1	0.135	4mU read method
17.2	1	10	10	480	517	1	945.986	668.368	1	0.141	4mU read method
25.8	1	10	10	480	517	1	952.676	670.941	1	0.143	4mU read method
34.4	1	10	10	480	517	1	957.108	672.142	1	0.141	4mU read method
43	1	10	10	480	517	1	959.261	674.739	1	0.142	4mU read method
51.6	1	10	10	480	517	1	963.229	673.121	1	0.141	4mU read method
60.2	1	10	10	480	517	1	963.077	672.885	1	0.142	4mU read method
68.8	1	10	10	480	517	1	965.043	675.432	1	0.136	4mU read method
77.4	1	10	10	480	517	1	964.441	673.043	1	0.142	4mU read method
86	1	10	10	480	517	1	966.288	673.564	1	0.137	4mU read method
94.6	1	10	10	480	517	1	968.582	674.497	1	0.137	4mU read method
103.2	1	10	10	480	517	1	967.415	674.468	1	0.136	4mU read method
111.8	1	10	10	480	517	1	968.649	676.007	1	0.142	4mU read method
120.4	1	10	10	480	517	1	967.635	674.937	1	0.141	4mU read method
129	1	10	10	480	517	1	967.036	676.084	1	0.141	4mU read method
137.6	1	10	10	480	517	1	968.094	675.731	1	0.139	4mU read method
146.2	1	10	10	480	517	1	970.009	675.97	1	0.137	4mU read method
154.8	1	10	10	480	517	1	969.377	673.391	1	0.138	4mU read method
163.4	1	10	10	480	517	1	970.615	674.991	1	0.137	4mU read method
172	1	10	10	480	517	1	970.564	677.588	1	0.135	4mU read method
180.6	1	10	10	480	517	1	971.7	677.587	1	0.141	4mU read method

Table 5. Poly (dA) + t-LNT

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	852.062	721.884	1	0.057	4mU read method

8.6	1	10	10	480	517	1	855.615	723.482	1	0.057	4mU read method
17.2	1	10	10	480	517	1	860.73	728.491	1	0.057	4mU read method
25.8	1	10	10	480	517	1	863.202	728.353	1	0.058	4mU read method
34.4	1	10	10	480	517	1	868.114	728.947	1	0.06	4mU read method
43	1	10	10	480	517	1	868.96	733.135	1	0.058	4mU read method
51.6	1	10	10	480	517	1	870.205	732.682	1	0.059	4mU read method
60.3	1	10	10	480	517	1	873.277	733.096	1	0.06	4mU read method
68.8	1	10	10	480	517	1	873.151	733.478	1	0.06	4mU read method
77.5	1	10	10	480	517	1	874.386	735.642	1	0.059	4mU read method
86	1	10	10	480	517	1	873.496	738.155	1	0.058	4mU read method
94.7	1	10	10	480	517	1	876.598	736.544	1	0.06	4mU read method
103.3	1	10	10	480	517	1	873.429	738.806	1	0.057	4mU read method
111.8	1	10	10	480	517	1	875.926	738.717	1	0.058	4mU read method
120.5	1	10	10	480	517	1	877.569	739.922	1	0.058	4mU read method
129	1	10	10	480	517	1	874.175	737.13	1	0.058	4mU read method
137.6	1	10	10	480	517	1	879.493	737.331	1	0.06	4mU read method
146.2	1	10	10	480	517	1	877.191	740.39	1	0.058	4mU read method
154.8	1	10	10	480	517	1	879.845	740.344	1	0.059	4mU read method
163.4	1	10	10	480	517	1	882.194	739.153	1	0.061	4mU read method
172	1	10	10	480	517	1	882.598	741.878	1	0.059	4mU read method
180.6	1	10	10	480	517	1	880.301	741.418	1	0.059	4mU read method
189.3	1	10	10	480	517	1	882.379	741.259	1	0.06	4mU read method
197.8	1	10	10	480	517	1	882.317	740.915	1	0.06	4mU read method
206.4	1	10	10	480	517	1	882.73	743.382	1	0.059	4mU read method
215	1	10	10	480	517	1	883.616	742.534	1	0.06	4mU read method
223.6	1	10	10	480	517	1	884.031	743.941	1	0.059	4mU read method
232.2	1	10	10	480	517	1	883.934	742.737	1	0.06	4mU read method
240.8	1	10	10	480	517	1	885.544	743.121	1	0.06	4mU read method
249.4	1	10	10	480	517	1	884.937	743.236	1	0.06	4mU read method

Table 6. Poly (dA) + GO + t-LNT.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	404.186	310.232	1	0.092	4mU read method
8.5	1	10	10	480	517	1	403.71	311.847	1	0.089	4mU read method
17.1	1	10	10	480	517	1	406.578	312.195	1	0.092	4mU read method
25.7	1	10	10	480	517	1	407.327	311.948	1	0.092	4mU read method
34.2	1	10	10	480	517	1	409.565	312.702	1	0.094	4mU read method
42.8	1	10	10	480	517	1	407.796	313.178	1	0.091	4mU read method
51.4	1	10	10	480	517	1	408.222	312.958	1	0.092	4mU read method
60	1	10	10	480	517	1	409.796	312.867	1	0.094	4mU read method
68.6	1	10	10	480	517	1	410.204	313.479	1	0.093	4mU read method

77.1	1	10	10	480	517	1	409.683	313.398	1	0.093	4mU read method
85.8	1	10	10	480	517	1	411.955	313.907	1	0.094	4mU read method
94.3	1	10	10	480	517	1	410.494	313.676	1	0.093	4mU read method
102.9	1	10	10	480	517	1	411.822	314.746	1	0.093	4mU read method
111.5	1	10	10	480	517	1	413.117	315.206	1	0.094	4mU read method
120.1	1	10	10	480	517	1	412.117	314.494	1	0.094	4mU read method
128.6	1	10	10	480	517	1	410.33	314.493	1	0.092	4mU read method
137.2	1	10	10	480	517	1	411.791	314.434	1	0.094	4mU read method
145.8	1	10	10	480	517	1	411.562	313.625	1	0.094	4mU read method
154.4	1	10	10	480	517	1	411.816	315.201	1	0.093	4mU read method
163	1	10	10	480	517	1	410.877	314.928	1	0.092	4mU read method
171.5	1	10	10	480	517	1	411.79	315.224	1	0.093	4mU read method
180.1	1	10	10	480	517	1	413.256	315.353	1	0.094	4mU read method
188.7	1	10	10	480	517	1	413.316	315.909	1	0.093	4mU read method
197.2	1	10	10	480	517	1	413.527	314.141	1	0.095	4mU read method

Table 7. Poly (dA) + AMY.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	324.872	278	1	0.053	4mU read method
8.6	1	10	10	480	517	1	325.476	279.85	1	0.052	4mU read method
17.2	1	10	10	480	517	1	326.541	280.409	1	0.052	4mU read method
25.8	1	10	10	480	517	1	327.978	281.069	1	0.053	4mU read method
34.4	1	10	10	480	517	1	328.283	281.356	1	0.053	4mU read method
42.9	1	10	10	480	517	1	328.721	282.042	1	0.052	4mU read method
51.5	1	10	10	480	517	1	330.957	282.584	1	0.054	4mU read method
60.2	1	10	10	480	517	1	330.824	282.85	1	0.054	4mU read method
68.7	1	10	10	480	517	1	330.104	282.923	1	0.053	4mU read method
77.4	1	10	10	480	517	1	331.28	282.948	1	0.054	4mU read method
86	1	10	10	480	517	1	331.715	283.297	1	0.054	4mU read method
94.6	1	10	10	480	517	1	332.07	283.276	1	0.054	4mU read method
103.2	1	10	10	480	517	1	331.205	283.81	1	0.053	4mU read method
111.8	1	10	10	480	517	1	332.806	282.833	1	0.056	4mU read method
120.4	1	10	10	480	517	1	332.67	282.632	1	0.056	4mU read method

Table 8. Poly (dA) + GO + s-CUR.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	137.743	76.494	1	0.211	4mU read method
8.5	1	10	10	480	517	1	138.044	76.877	1	0.21	4mU read method
17.1	1	10	10	480	517	1	137.472	76.997	1	0.207	4mU read method

25.7	1	10	10	480	517	1	138.489	76.899	1	0.211	4mU read method
34.2	1	10	10	480	517	1	138.346	76.838	1	0.211	4mU read method
42.8	1	10	10	480	517	1	138.831	77.158	1	0.21	4mU read method
51.4	1	10	10	480	517	1	138.793	77.62	1	0.208	4mU read method
60	1	10	10	480	517	1	139.223	77.784	1	0.208	4mU read method
68.6	1	10	10	480	517	1	138.913	77.823	1	0.207	4mU read method
77.1	1	10	10	480	517	1	139.07	77.334	1	0.21	4mU read method
85.7	1	10	10	480	517	1	138.832	77.996	1	0.206	4mU read method
94.3	1	10	10	480	517	1	139.325	77.555	1	0.21	4mU read method
102.9	1	10	10	480	517	1	139.531	77.754	1	0.209	4mU read method
111.5	1	10	10	480	517	1	138.993	77.869	1	0.207	4mU read method
120	1	10	10	480	517	1	139.978	77.682	1	0.211	4mU read method

Table 9. Poly (dA) + s-CUR.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	282.47	189.474	1	0.141	4mU read method
8.6	1	10	10	480	517	1	284.637	191.049	1	0.14	4mU read method
17.2	1	10	10	480	517	1	287.197	191.795	1	0.142	4mU read method
25.8	1	10	10	480	517	1	290.141	193.104	1	0.143	4mU read method
34.4	1	10	10	480	517	1	292.342	194.086	1	0.144	4mU read method
43	1	10	10	480	517	1	294.574	195.452	1	0.145	4mU read method
51.6	1	10	10	480	517	1	294.954	195.633	1	0.145	4mU read method
60.2	1	10	10	480	517	1	296.065	196.04	1	0.145	4mU read method
68.8	1	10	10	480	517	1	296.034	195.666	1	0.146	4mU read method
77.4	1	10	10	480	517	1	296.988	195.57	1	0.147	4mU read method
86	1	10	10	480	517	1	296.198	195.083	1	0.147	4mU read method
94.6	1	10	10	480	517	1	294.783	193.957	1	0.148	4mU read method
103.2	1	10	10	480	517	1	292.588	193.095	1	0.147	4mU read method
111.8	1	10	10	480	517	1	290.804	192.074	1	0.146	4mU read method
120.4	1	10	10	480	517	1	290.808	192.396	1	0.146	4mU read method
129	1	10	10	480	517	1	292.62	193.863	1	0.145	4mU read method
137.6	1	10	10	480	517	1	296.352	198.405	1	0.141	4mU read method
146.2	1	10	10	480	517	1	306.158	204.94	1	0.141	4mU read method

Table 10. Poly (dA) + LAM.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	327.974	283.036	1	0.05	4mU read method
8.6	1	10	10	480	517	1	330.45	283.422	1	0.052	4mU read method
17.2	1	10	10	480	517	1	330.691	285.142	1	0.051	4mU read method

25.8	1	10	10	480	517	1	331.802	285.265	1	0.052	4mU read method
34.4	1	10	10	480	517	1	331.847	287.174	1	0.049	4mU read method
43	1	10	10	480	517	1	333.035	286.237	1	0.052	4mU read method
51.6	1	10	10	480	517	1	333.623	287.218	1	0.051	4mU read method
60.2	1	10	10	480	517	1	333.729	287.57	1	0.051	4mU read method
68.9	1	10	10	480	517	1	334.52	287.883	1	0.051	4mU read method
77.4	1	10	10	480	517	1	335.514	287.582	1	0.053	4mU read method
86.1	1	10	10	480	517	1	336.194	288.282	1	0.052	4mU read method
94.7	1	10	10	480	517	1	335.497	287.947	1	0.052	4mU read method
103.2	1	10	10	480	517	1	335.769	287.138	1	0.053	4mU read method
111.9	1	10	10	480	517	1	336.393	287.873	1	0.053	4mU read method
120.4	1	10	10	480	517	1	336.168	287.687	1	0.053	4mU read method
129	1	10	10	480	517	1	337.06	289.188	1	0.052	4mU read method
137.6	1	10	10	480	517	1	337.373	288.607	1	0.053	4mU read method

Table 11. Poly (dA) + PUL.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	321.103	278.996	1	0.048	4mU read method
8.6	1	10	10	480	517	1	322.688	279.808	1	0.049	4mU read method
17.2	1	10	10	480	517	1	324.318	279.364	1	0.051	4mU read method
25.8	1	10	10	480	517	1	325.841	282.052	1	0.049	4mU read method
34.4	1	10	10	480	517	1	327.282	282.491	1	0.05	4mU read method
43	1	10	10	480	517	1	327.044	282.376	1	0.05	4mU read method
51.6	1	10	10	480	517	1	327.866	283.231	1	0.05	4mU read method
60.2	1	10	10	480	517	1	329.04	283.204	1	0.051	4mU read method
68.8	1	10	10	480	517	1	328.093	283.259	1	0.05	4mU read method
77.4	1	10	10	480	517	1	328.922	283.597	1	0.051	4mU read method
86	1	10	10	480	517	1	328.999	284.184	1	0.05	4mU read method
94.6	1	10	10	480	517	1	330.651	283.958	1	0.052	4mU read method
103.2	1	10	10	480	517	1	330.397	284.456	1	0.051	4mU read method
111.8	1	10	10	480	517	1	330.144	284.446	1	0.051	4mU read method
120.4	1	10	10	480	517	1	330.248	285.35	1	0.05	4mU read method
129	1	10	10	480	517	1	330.041	284.447	1	0.051	4mU read method

Table 12. Poly (dA) + XAN.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	319.027	275.265	1	0.05	4mU read method
8.6	1	10	10	480	517	1	321.286	276.471	1	0.051	4mU read method
17.2	1	10	10	480	517	1	323.653	277.701	1	0.052	4mU read method

25.8	1	10	10	480	517	1	323.839	278.194	1	0.052	4mU read method
34.4	1	10	10	480	517	1	324.931	278.759	1	0.052	4mU read method
43	1	10	10	480	517	1	325.45	279.838	1	0.052	4mU read method
51.6	1	10	10	480	517	1	325.288	280.285	1	0.051	4mU read method
60.2	1	10	10	480	517	1	326.944	280.381	1	0.052	4mU read method
68.8	1	10	10	480	517	1	327.559	280.148	1	0.053	4mU read method
77.4	1	10	10	480	517	1	327.36	280.848	1	0.052	4mU read method
86	1	10	10	480	517	1	327.38	280.971	1	0.052	4mU read method
94.6	1	10	10	480	517	1	328.019	280.725	1	0.053	4mU read method
103.2	1	10	10	480	517	1	327.955	282.102	1	0.051	4mU read method
111.8	1	10	10	480	517	1	328.733	281.726	1	0.053	4mU read method
120.4	1	10	10	480	517	1	327.276	281.318	1	0.052	4mU read method
129	1	10	10	480	517	1	328.393	281.889	1	0.052	4mU read method
137.6	1	10	10	480	517	1	327.762	281.239	1	0.052	4mU read method
146.2	1	10	10	480	517	1	328.714	281.628	1	0.053	4mU read method
154.8	1	10	10	480	517	1	328.985	281.157	1	0.054	4mU read method
163.4	1	10	10	480	517	1	329.328	281.756	1	0.053	4mU read method
172	1	10	10	480	517	1	328.588	281.205	1	0.053	4mU read method

Table 13. Time dependence of FA for poly (dA) upon addition of s-LNT.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Temp	Ivv	Ivh	GF	Anis
0	1	10	10	480	517	0.1	23.1	288.428	246.34	1	0.054
7	1	10	10	480	517	0.1	23.2	291.441	245.317	1	0.059
14	1	10	10	480	517	0.1	23.2	289.775	244.748	1	0.058
21	1	10	10	480	517	0.1	23.2	288.918	244.473	1	0.057
28	1	10	10	480	517	0.1	23.3	289.5	243.799	1	0.059
35	1	10	10	480	517	0.1	23.3	291.166	245.829	1	0.058
42	1	10	10	480	517	0.1	23.3	290.347	244.341	1	0.059
49	1	10	10	480	517	0.1	23.3	291.288	245.76	1	0.058
56	1	10	10	480	517	0.1	23.3	289.09	245.27	1	0.056
63	1	10	10	480	517	0.1	23.4	292.765	246.288	1	0.059
70	1	10	10	480	517	0.1	23.4	290.72	247.12	1	0.056
77	1	10	10	480	517	0.1	23.4	292.141	245.639	1	0.059
84	1	10	10	480	517	0.1	23.4	288.592	243.353	1	0.058
91	1	10	10	480	517	0.1	23.4	292.773	245.295	1	0.061
98	1	10	10	480	517	0.1	23.4	289.418	245.776	1	0.056
105	1	10	10	480	517	0.1	23.4	289.064	245.281	1	0.056
111.9	1	10	10	480	517	0.1	23.4	289.127	245.428	1	0.056
118.9	1	10	10	480	517	0.1	23.4	290.001	246.288	1	0.056
125.9	1	10	10	480	517	0.1	23.4	288.629	244.055	1	0.057
132.9	1	10	10	480	517	0.1	23.5	289.573	245.466	1	0.057
139.9	1	10	10	480	517	0.1	23.5	292.287	244.473	1	0.061

146.9	1	10	10	480	517	0.1	23.5	292.919	243.931	1	0.063
153.9	1	10	10	480	517	0.1	23.5	292.017	247.044	1	0.057
160.9	1	10	10	480	517	0.1	23.5	292.172	245.621	1	0.059
167.9	1	10	10	480	517	0.1	23.5	288.888	244.73	1	0.057
174.9	1	10	10	480	517	0.1	23.5	288.57	245.162	1	0.056
181.9	1	10	10	480	517	0.1	23.5	290.68	245.003	1	0.059
189	1	10	10	480	517	0.1	23.6	288.281	245.983	1	0.054
196	1	10	10	480	517	0.1	23.6	288.704	244.658	1	0.057
202.9	1	10	10	480	517	0.1	23.6	291.67	245.395	1	0.059
209.9	1	10	10	480	517	0.1	23.6	290.276	244.596	1	0.059
216.9	1	10	10	480	517	0.1	23.6	289.238	246.528	1	0.055
223.9	1	10	10	480	517	0.1	23.6	289.777	243.942	1	0.059
230.9	1	10	10	480	517	0.1	23.6	273.789	217.117	1	0.08
237.9	1	10	10	480	517	0.1	23.6	285.193	208.46	1	0.109
244.9	1	10	10	480	517	0.1	23.7	285.254	205.648	1	0.114
251.9	1	10	10	480	517	0.1	23.7	288.379	203.829	1	0.121
258.9	1	10	10	480	517	0.1	23.7	290.616	203.49	1	0.125
265.9	1	10	10	480	517	0.1	23.7	293.103	202.208	1	0.13
272.9	1	10	10	480	517	0.1	23.8	293.41	202.106	1	0.131
279.9	1	10	10	480	517	0.1	23.8	293.722	203.056	1	0.13
286.9	1	10	10	480	517	0.1	23.8	294.981	202.529	1	0.132
293.9	1	10	10	480	517	0.1	23.8	297.46	202.035	1	0.136
300.9	1	10	10	480	517	0.1	23.8	296.238	202.4	1	0.134
307.9	1	10	10	480	517	0.1	23.8	293.93	201.762	1	0.132
314.9	1	10	10	480	517	0.1	23.8	298.477	202.023	1	0.137
321.9	1	10	10	480	517	0.1	23.8	297.079	201.759	1	0.136
328.9	1	10	10	480	517	0.1	23.8	299.496	202.852	1	0.137
336	1	10	10	480	517	0.1	23.9	298.08	203.992	1	0.133
343	1	10	10	480	517	0.1	23.9	302.595	202.524	1	0.141
350	1	10	10	480	517	0.1	23.9	301.756	202.305	1	0.141
357	1	10	10	480	517	0.1	23.9	300.077	203.706	1	0.136
364	1	10	10	480	517	0.1	23.9	301.691	201.443	1	0.142
371	1	10	10	480	517	0.1	23.9	301.693	203.629	1	0.138
378	1	10	10	480	517	0.1	23.9	303.037	205.634	1	0.136
385	1	10	10	480	517	0.1	23.9	304.631	203.961	1	0.141
392	1	10	10	480	517	0.1	23.9	304.836	203.13	1	0.143
399	1	10	10	480	517	0.1	24	304.678	203.137	1	0.143
406	1	10	10	480	517	0.1	24	304.79	206.389	1	0.137
413	1	10	10	480	517	0.1	24	307.048	205.751	1	0.141
420	1	10	10	480	517	0.1	24	305.608	203.949	1	0.142
427	1	10	10	480	517	0.1	24	306.426	206.156	1	0.14
434	1	10	10	480	517	0.1	24	306.449	204.26	1	0.143
441	1	10	10	480	517	0.1	24	304.362	204.321	1	0.14
448	1	10	10	480	517	0.1	24	305.416	207.152	1	0.137

455	1	10	10	480	517	0.1	24	308.034	206.205	1	0.141
462	1	10	10	480	517	0.1	24	305.85	207.862	1	0.136
469	1	10	10	480	517	0.1	24	306.984	207.26	1	0.138
476	1	10	10	480	517	0.1	24	307.383	205.939	1	0.141
483	1	10	10	480	517	0.1	24	310.252	205.787	1	0.145
490	1	10	10	480	517	0.1	24	308.106	208.005	1	0.138
497	1	10	10	480	517	0.1	24	308.438	206.766	1	0.141
504	1	10	10	480	517	0.1	24	307.346	207.158	1	0.139
511	1	10	10	480	517	0.1	24	308.504	206.524	1	0.141
518	1	10	10	480	517	0.1	24	308.664	206.833	1	0.141
525	1	10	10	480	517	0.1	24	308.788	209.15	1	0.137
532	1	10	10	480	517	0.1	24	309.415	205.771	1	0.144
539	1	10	10	480	517	0.1	24	310.878	208.023	1	0.141
546	1	10	10	480	517	0.1	24	309.414	209.551	1	0.137
553	1	10	10	480	517	0.1	24	309.982	206.386	1	0.143
560	1	10	10	480	517	0.1	24	308.477	208.586	1	0.138
567	1	10	10	480	517	0.1	24.1	309.455	209.303	1	0.138
574	1	10	10	480	517	0.1	24.1	309.094	207.615	1	0.14
581	1	10	10	480	517	0.1	24.1	308.959	207.963	1	0.139
588	1	10	10	480	517	0.1	24.1	310.149	208.6	1	0.14
595	1	10	10	480	517	0.1	24.1	309.883	209.841	1	0.137
602	1	10	10	480	517	0.1	24.1	309.656	209.029	1	0.138
609	1	10	10	480	517	0.1	24.1	309.285	208.118	1	0.139
616	1	10	10	480	517	0.1	24.1	311.589	209.869	1	0.139
623	1	10	10	480	517	0.1	24.1	311.956	209.24	1	0.141
630	1	10	10	480	517	0.1	24.1	311.519	208.295	1	0.142
637	1	10	10	480	517	0.1	24.1	312.721	210.82	1	0.139
644	1	10	10	480	517	0.1	24.1	311.95	207.777	1	0.143
651	1	10	10	480	517	0.1	24.1	310.606	209.14	1	0.139
658	1	10	10	480	517	0.1	24.1	313.5	210.09	1	0.141
665	1	10	10	480	517	0.1	24.1	312.945	208.105	1	0.144
672	1	10	10	480	517	0.1	24.1	309.71	210.601	1	0.136
679	1	10	10	480	517	0.1	24.1	312.31	208.94	1	0.142
686	1	10	10	480	517	0.1	24.1	310.52	211.269	1	0.135
693	1	10	10	480	517	0.1	24.1	311.323	209.209	1	0.14
700	1	10	10	480	517	0.1	24.1	315.598	209.611	1	0.144
707	1	10	10	480	517	0.1	24.1	311.022	210.769	1	0.137
714	1	10	10	480	517	0.1	24.2	313.673	208.097	1	0.145
721	1	10	10	480	517	0.1	24.2	310.584	210.031	1	0.138
728	1	10	10	480	517	0.1	24.2	313.055	211.358	1	0.138
735	1	10	10	480	517	0.1	24.2	313.822	211.483	1	0.139
742	1	10	10	480	517	0.1	24.2	317.001	211.622	1	0.142
749	1	10	10	480	517	0.1	24.2	313.598	211.097	1	0.139
756	1	10	10	480	517	0.1	24.2	311.54	211.765	1	0.136

763	1	10	10	480	517	0.1	24.2	312.461	211.29	1	0.138
770	1	10	10	480	517	0.1	24.2	314.075	210.605	1	0.141
777.1	1	10	10	480	517	0.1	24.2	315.09	210.536	1	0.142
784.1	1	10	10	480	517	0.1	24.2	311.263	209.11	1	0.14
791.1	1	10	10	480	517	0.1	24.2	314.14	212.21	1	0.138
798.1	1	10	10	480	517	0.1	24.2	310.895	212.588	1	0.134
805.1	1	10	10	480	517	0.1	24.2	317.137	210.857	1	0.144
812.1	1	10	10	480	517	0.1	24.2	312.644	210.824	1	0.139
819.1	1	10	10	480	517	0.1	24.2	312.776	210.983	1	0.139
826.1	1	10	10	480	517	0.1	24.2	311.797	209.715	1	0.14
833.1	1	10	10	480	517	0.1	24.2	314.045	212.234	1	0.138
840.1	1	10	10	480	517	0.1	24.2	314.138	211.007	1	0.14
847.1	1	10	10	480	517	0.1	24.2	313.325	211.76	1	0.138
854.1	1	10	10	480	517	0.1	24.2	315.482	211.421	1	0.141
861.1	1	10	10	480	517	0.1	24.2	313.398	211.204	1	0.139
868.1	1	10	10	480	517	0.1	24.2	313.112	210.912	1	0.139
875.1	1	10	10	480	517	0.1	24.3	313.512	211.302	1	0.139
882.1	1	10	10	480	517	0.1	24.2	315.601	211.831	1	0.14
889.1	1	10	10	480	517	0.1	24.2	314.174	212.725	1	0.137
896.1	1	10	10	480	517	0.1	24.3	315.976	208.326	1	0.147
903.1	1	10	10	480	517	0.1	24.2	314.03	212.685	1	0.137
910.1	1	10	10	480	517	0.1	24.2	314.487	210.105	1	0.142

Table 14. Poly (dC) only.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	326.018	254.404	1	0.086	4mU read method
8.6	1	10	10	480	517	1	327.904	255.488	1	0.086	4mU read method
17.2	1	10	10	480	517	1	328.369	256.505	1	0.085	4mU read method
25.7	1	10	10	480	517	1	329.328	256.647	1	0.086	4mU read method
34.3	1	10	10	480	517	1	330.616	257.51	1	0.086	4mU read method
43	1	10	10	480	517	1	331.827	258.029	1	0.087	4mU read method
51.5	1	10	10	480	517	1	332.413	259.393	1	0.086	4mU read method
60.1	1	10	10	480	517	1	333.235	258.994	1	0.087	4mU read method
68.7	1	10	10	480	517	1	334.048	259.054	1	0.088	4mU read method
77.3	1	10	10	480	517	1	333.521	258.853	1	0.088	4mU read method
85.9	1	10	10	480	517	1	333.992	260.045	1	0.087	4mU read method
94.5	1	10	10	480	517	1	335.092	259.91	1	0.088	4mU read method
103.1	1	10	10	480	517	1	335.293	259.818	1	0.088	4mU read method
111.7	1	10	10	480	517	1	335.787	261.112	1	0.087	4mU read method
120.3	1	10	10	480	517	1	335.921	260.026	1	0.089	4mU read method
128.9	1	10	10	480	517	1	335.524	260.712	1	0.087	4mU read method

137.5	1	10	10	480	517	1	335.762	260.541	1	0.088	4mU read method
146.1	1	10	10	480	517	1	336.603	260.088	1	0.089	4mU read method

Table 15. Poly (dC) + s-LNT.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	330.032	253.899	1	0.091	4mU read method
8.6	1	10	10	480	517	1	331.72	256.087	1	0.09	4mU read method
17.2	1	10	10	480	517	1	333.026	255	1	0.093	4mU read method
25.8	1	10	10	480	517	1	335.099	256.564	1	0.093	4mU read method
34.4	1	10	10	480	517	1	334.893	257.212	1	0.091	4mU read method
43	1	10	10	480	517	1	335.526	257.234	1	0.092	4mU read method
51.6	1	10	10	480	517	1	336.467	257.931	1	0.092	4mU read method
60.2	1	10	10	480	517	1	336.745	257.828	1	0.093	4mU read method
68.8	1	10	10	480	517	1	336.519	258.421	1	0.092	4mU read method
77.4	1	10	10	480	517	1	338.278	258.429	1	0.093	4mU read method
86	1	10	10	480	517	1	336.986	258.364	1	0.092	4mU read method
94.6	1	10	10	480	517	1	337.384	258.445	1	0.092	4mU read method
103.2	1	10	10	480	517	1	338.717	258.279	1	0.094	4mU read method
111.8	1	10	10	480	517	1	338.991	258.461	1	0.094	4mU read method
120.4	1	10	10	480	517	1	338.152	259.169	1	0.092	4mU read method
129	1	10	10	480	517	1	338.519	258.167	1	0.094	4mU read method
137.6	1	10	10	480	517	1	338.376	258.627	1	0.093	4mU read method
146.2	1	10	10	480	517	1	339.741	258.834	1	0.094	4mU read method
154.8	1	10	10	480	517	1	339.366	259.188	1	0.093	4mU read method
163.4	1	10	10	480	517	1	338.912	259.385	1	0.093	4mU read method
172	1	10	10	480	517	1	339.386	258.068	1	0.095	4mU read method
180.6	1	10	10	480	517	1	338.662	259.576	1	0.092	4mU read method

Table 16. Poly (dC) + t-LNT.

Time	Cuvette	ExSlit	EmSlit	ExWave	EmWave	Integr	Ivv	Ivh	GF	Anis	Comment
0	1	10	10	480	517	1	329.016	256.516	1	0.086	4mU read method
8.6	1	10	10	480	517	1	331.613	257.021	1	0.088	4mU read method
17.2	1	10	10	480	517	1	332.494	258.733	1	0.087	4mU read method
25.8	1	10	10	480	517	1	332.672	258.65	1	0.087	4mU read method
34.3	1	10	10	480	517	1	333.398	260.217	1	0.086	4mU read method
42.9	1	10	10	480	517	1	334.68	258.829	1	0.089	4mU read method
51.5	1	10	10	480	517	1	335.83	259.595	1	0.089	4mU read method
60.1	1	10	10	480	517	1	335.373	260.13	1	0.088	4mU read method
68.7	1	10	10	480	517	1	336.302	261.451	1	0.087	4mU read method

77.3	1	10	10	480	517	1	336.266	259.719	1	0.089	4mU read method
85.9	1	10	10	480	517	1	337.432	260.688	1	0.089	4mU read method
94.5	1	10	10	480	517	1	337.078	260.6	1	0.089	4mU read method

3 Sample preparation

3.1 Preparation of GO.

Natural graphite powder was used for preparing the graphene oxide through a modified Hummers method. The synthetic procedure was described as follows: graphite (6g) and sodium nitrate (3g) were put into a 1000 ml flask at 0°C. Then, concentrated H_2SO_4 (150ml) was slowly added in the flask under continuously stirring, keeping the temperature of mixture at 5°C for 2 h. Subsequently, 22g of $KMnO_4$ was added in small batch maintaining the temperature at ~10°C. After that, the reaction temperature was elevated to 35°C keeping for 2 h. After the accomplishment of reaction, 270 ml of water was poured slowly into the solution with vigorous stirring to obtain dark brown suspension. The suspension was further treated by adding the mixture of H_2O_2 (21ml, 30%) and water (165 ml) to remove the residual permanganate and MnO_2. The resulting suspension has bright yellow color and was separated by vacuum filtration. The yellow-brown graphite oxide powders were washed for four times with warm (~40°C) diluted HCl (3%, 450 ml) solution, and were dried finally at 60°C in oven.

3.2 Purification of LNT.

To obtain pure t-LNT with relatively narrow molecular weight distribution, the extracted t-LNT was dissolved in water and depolymerized in ultrasonic crasher (Ningbo Scientz Biotechnology Co., Ltd, Zhejiang, China) with 600 W of power for 1

h. Acetone was then added dropwise into the solution to get the cloudy mixture at room temperature. The resulting mixture was warmed up to 50°C and kept for 2 h, and was then deposited over night at room temperature. The mixture was centrifuged at 8,000 rpm for 30 min to separate the clear supernatant and the gel phase. The gel component was dissolved in ultrapure water again to obtain a clear solution, which was then dialyzed against distilled water for 5 days, filtered, and lyophilized to give the colorless flakes named as t-LNT.

References

1. W. S. Hummers Jr and R. E. Offeman, *J. Am. Chem. Soc.*, 1958**, 80**, 1339.

2. J. Zhang, H. Yang, G. Shen, P. Cheng and S. Guo, *Chem. Commun.*, 2010, **46**, 1112-1114.