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Supporting Information

Synthesis of highly fluorescent dual-emission red carbon dots and their applications in optoelectronic devices and water detection

Qingwen Guan,[a] Rigu Su,[a] Miaoran Zhang,[a] Rui Zhang,[a] Weijun Li,[a] Dong Wang,[*b]

Meng Xu,[b] Ling Fei,[c] Quan Xu[*a]

State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum-Beijing, 102249, China;

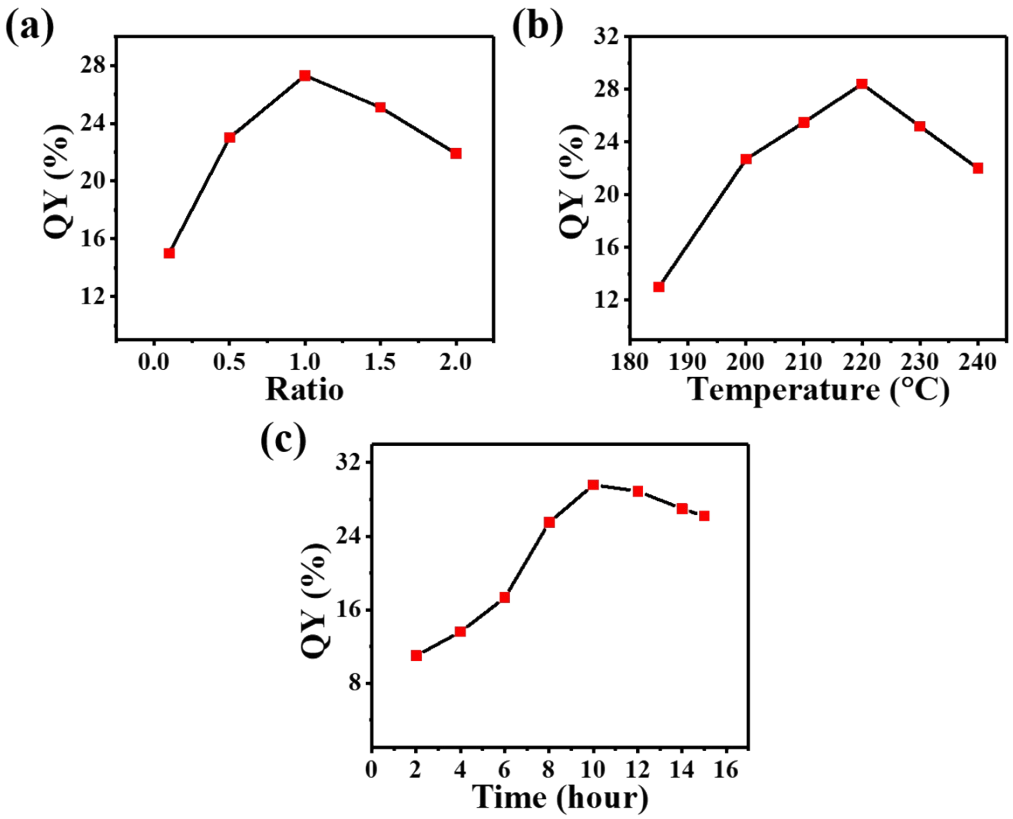

Fig. S1 Quantum yield results by (a) ratio of sulfamide to O-phenylenediamine, (b) temperature, and (c) time of the solvothermal reaction.

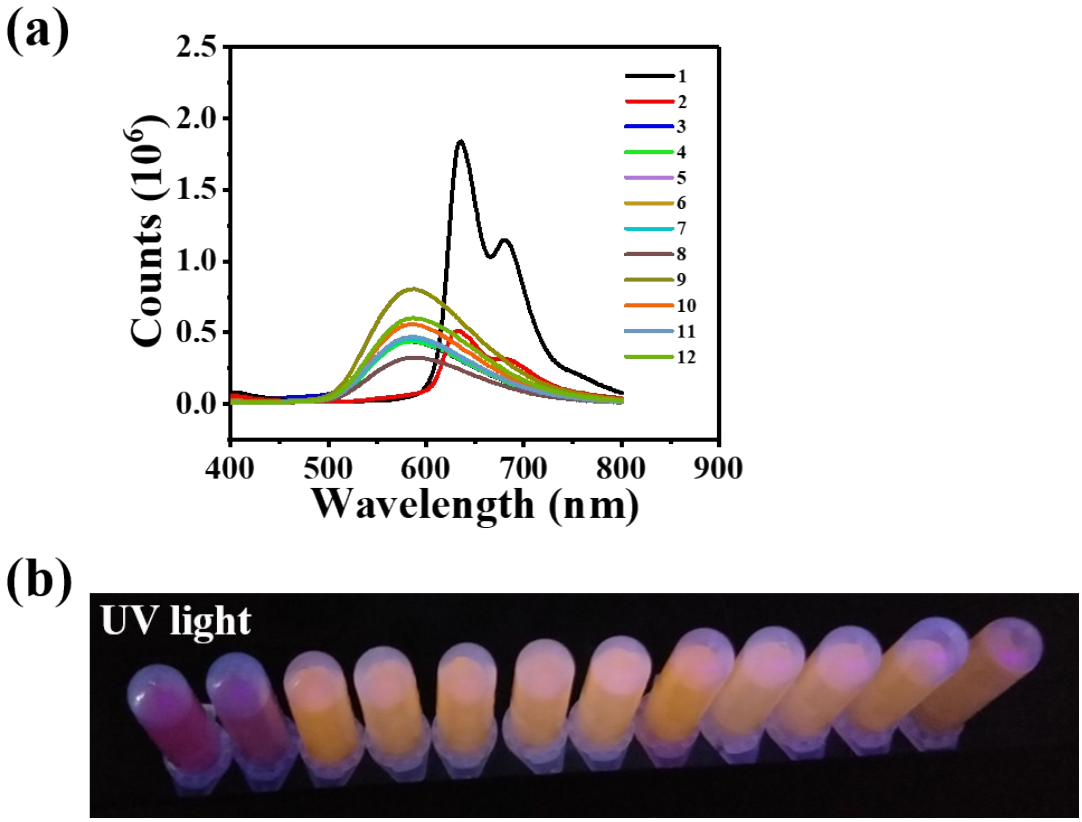

Fig. S2 (a) PL spectrum of CDs under different pH conditions (Ex=560 nm). (b) Picture of CDs at different PH (left, 1-12) conditions under UV light (λ=365 nm).

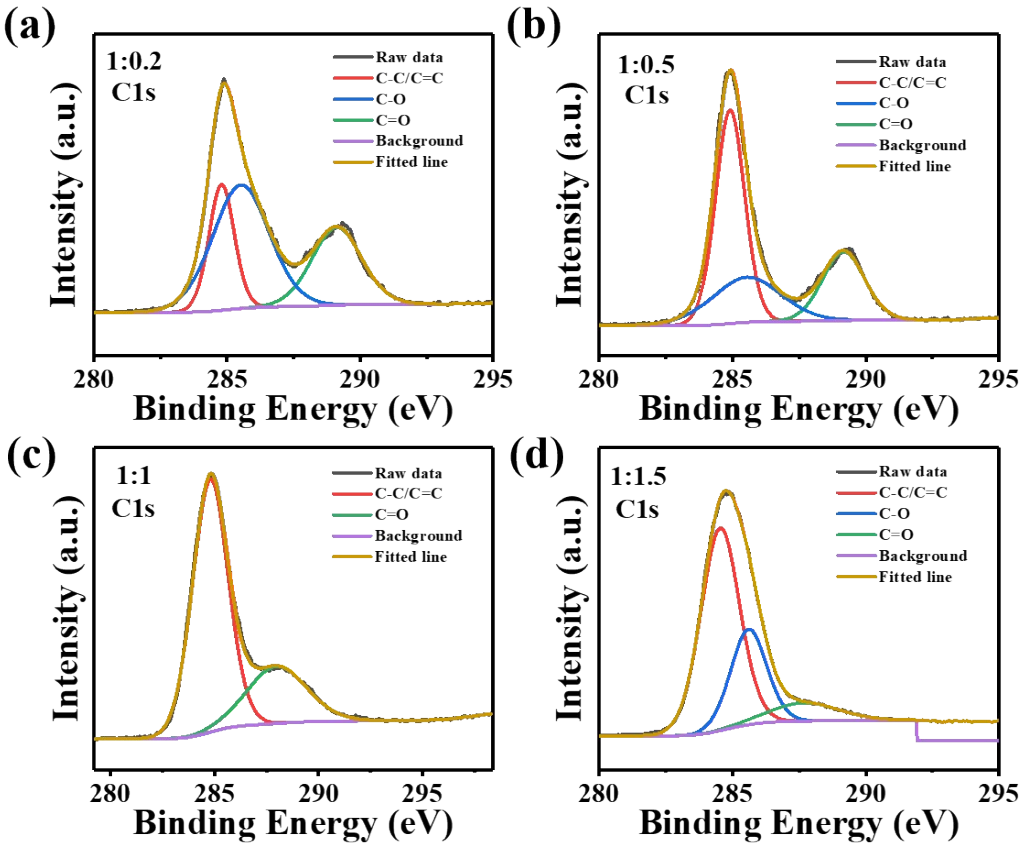

Fig. S3 High-resolution C1s XPS spectra for CDs of different precursor proportions.

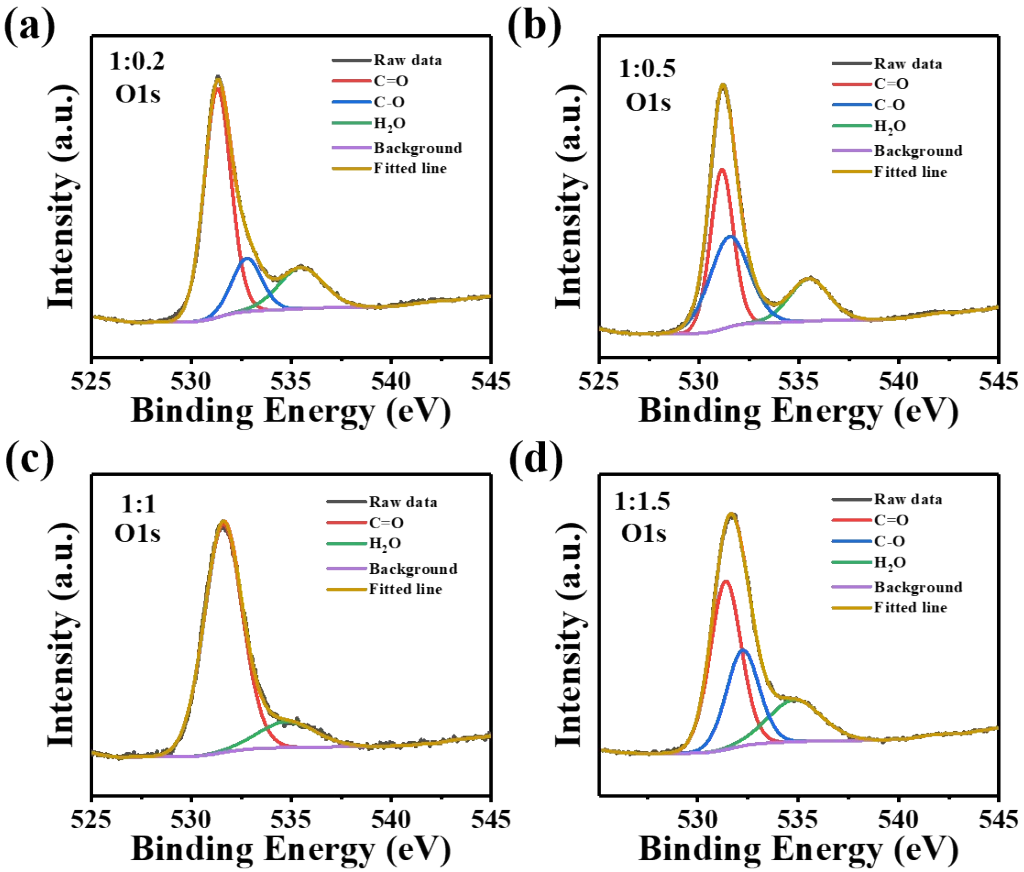

Fig. S4 High-resolution O1s XPS spectra for CDs of different precursor proportions.

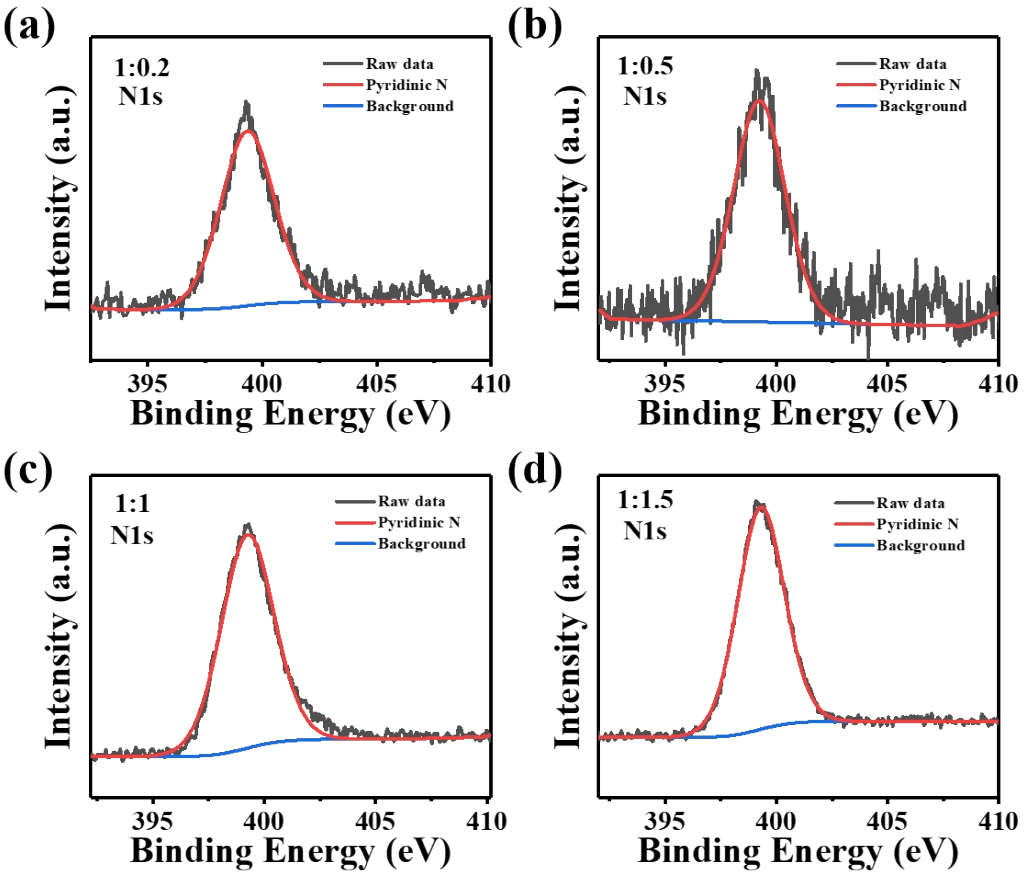

Fig. S5 High-resolution N1s XPS spectra for CDs of different precursor proportions.

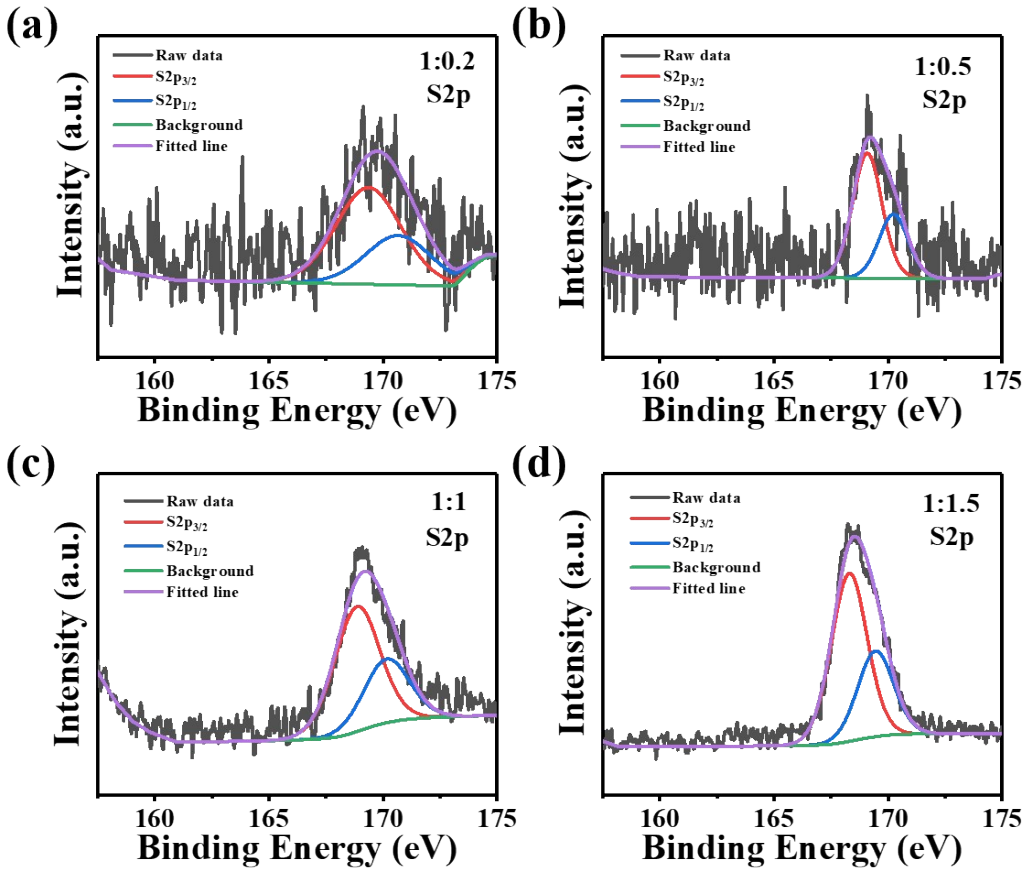

Fig. S6 High-resolution S2p XPS spectra for CDs of different precursor proportions.

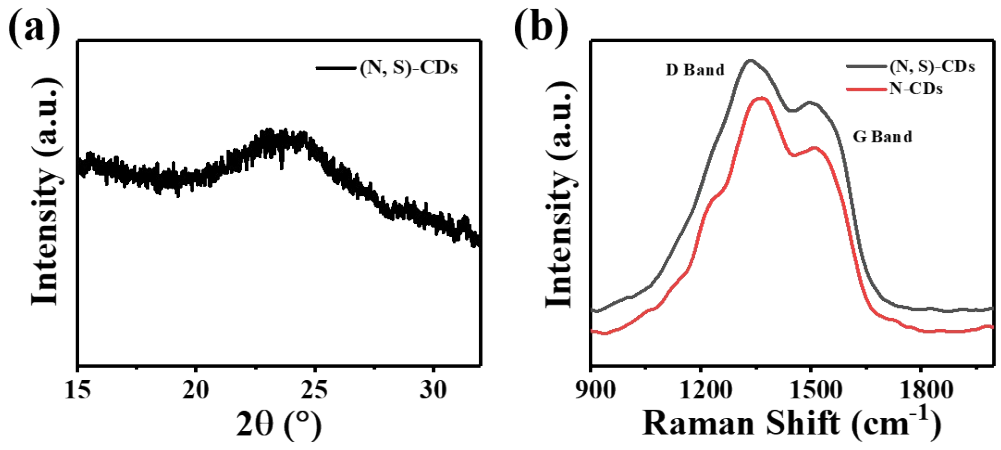

Fig. S7 (a) XRD and (b) Raman spectrum of the prepared CDs

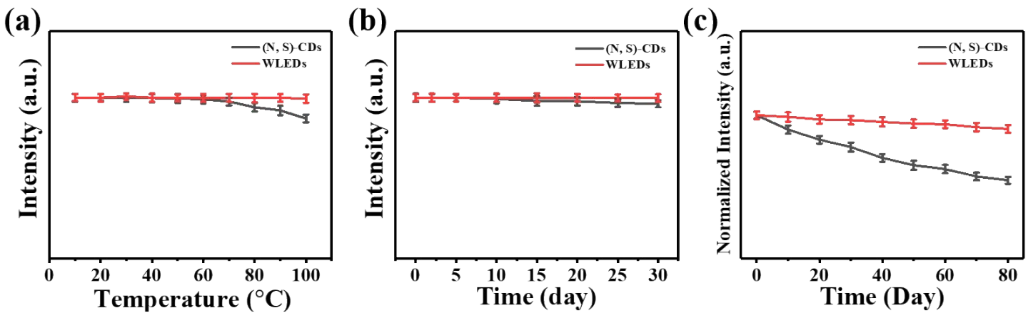

Fig. S8 The PL intensity variation of the CDs phosphors and WLEDs versus (a) changing temperature and (b) different storage time in ambient environment. (c) Evolution of the PL intensity of CDs and WLEDs, under UV light (12W, 360 nm)

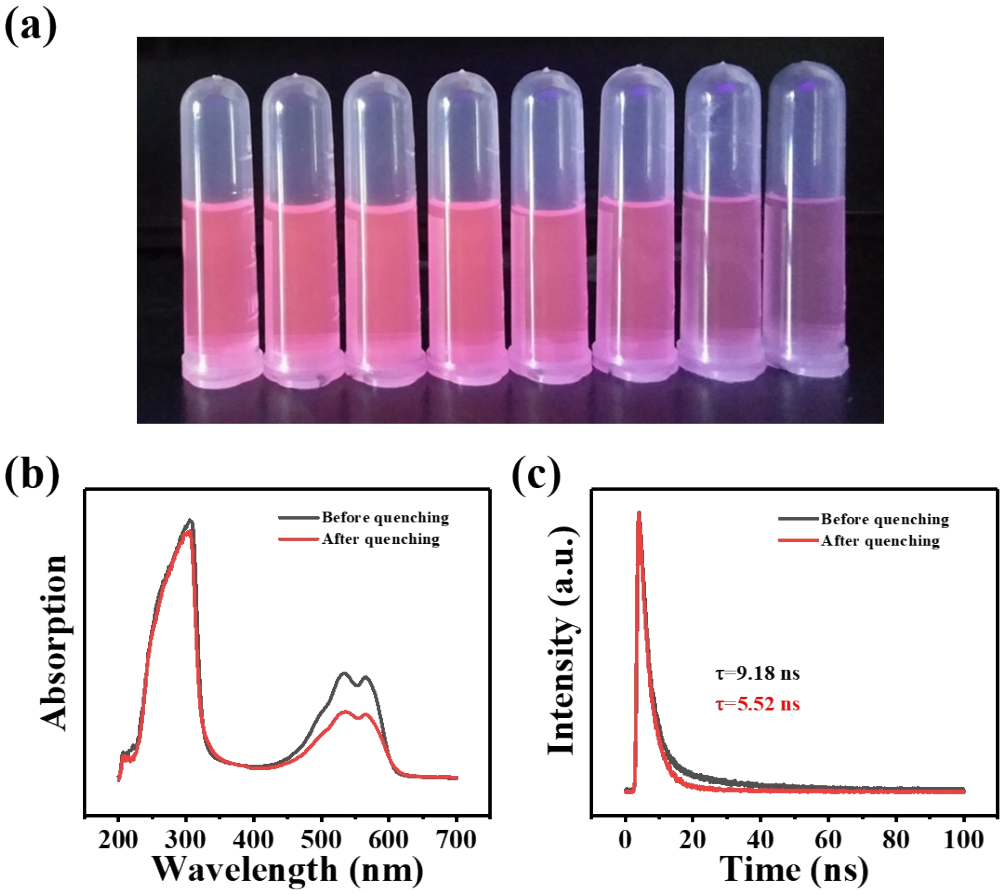

Fig. S9 (a) PL photos of 30 μL (N, S)-CDs dispersed in ethanol with various water contents (%) under 365 nm UV light. (b) Absorption spectra and (c) lifetimes of (N, S)-CDs before and after the quenching of ethanol with water contents of 70%.

Table S1. The amplitudes and time constants for two-component exponential fits of the four CDs samples.

Samples	λ/nm	τ1/ns	A1/%	τ2/ns	A2/%	x^2	τ/ns
1:0.2	625	2.76	92.93	20.08	7.07	1.074	3.98
1:0.5		3.30	72.72	17.90	27.28	1.051	7.28
1:1		4.21	68.33	19.90	31.67	1.012	9.18
1:1.5		3.15	80.91	17.83	19.09	1.090	5.95

Table S2. Intermediate parameters for analysis of water content detection results.

Water content	Em = 600 nm		Em = 650 nm	
(%)	F (10^6)	ΔF (10^6)	F (10^6)	ΔF (10^6)
0	4.208	0.139	3.158	0.084
2	4.069	0.348	3.074	0.141
5	3.860	0.653	3.017	0.248
10	3.555	0.986	2.910	0.527
30	3.222	1.196	2.631	0.799
40	3.012	1.217	2.359	0.992
50	2.991	1.739	2.166	1.408
70	2.469		1.750	