applied sciences

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Cold crystallization kinetics and thermal degradation of PLA composites with metal oxide nanofillers

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Citation: Tarani, E.; Pušnik Črešnar, K.; Zemljič, L.F.; Chrissafis, K.; Papageorgiou, G.Z.; Lambropoulou, D.; Zamboulis, A.; Bikiaris, D.; Terzopoulou, Z. Cold Crystallization Kinetics and Thermal Degradation of PLA Composites with Metal Oxide Nanofillers. *Appl. Sci.* **2021**, *11*, 3004. https://doi.org/10.3390/app11073004

Academic Editor: Jordi Puiggalí

Received: 24 February 2021
Accepted: 23 March 2021
Published: 27 March 2021

Supplementary data

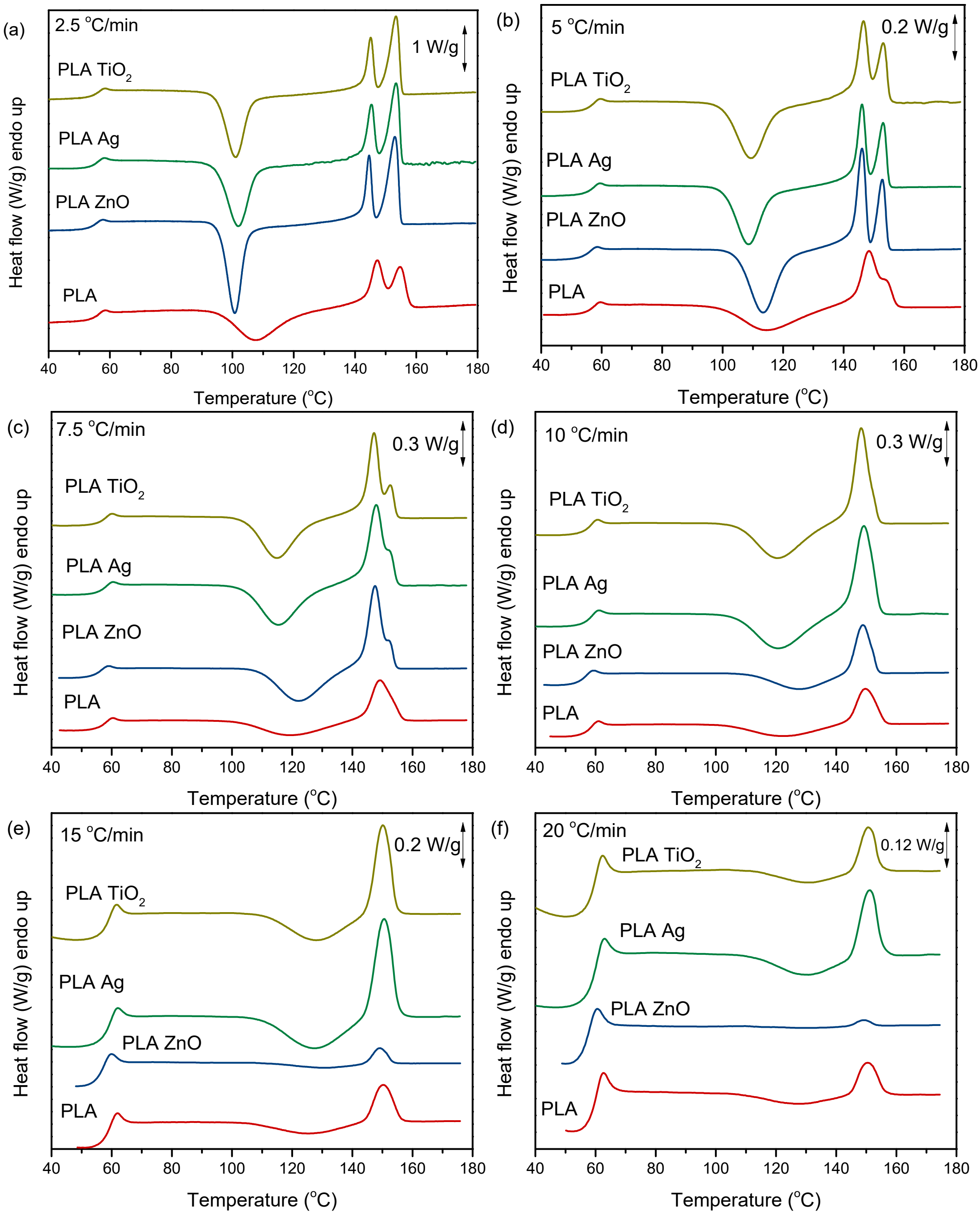

Figure S1. DSC heating scans of PLA and its composites with heating rates (a) 2.5 °C/min, (b) 5 °C/min, (c) 7.5 °C/min, (d) 10 °C/min, (e) 15 °C/min, (f) 20 °C/min.

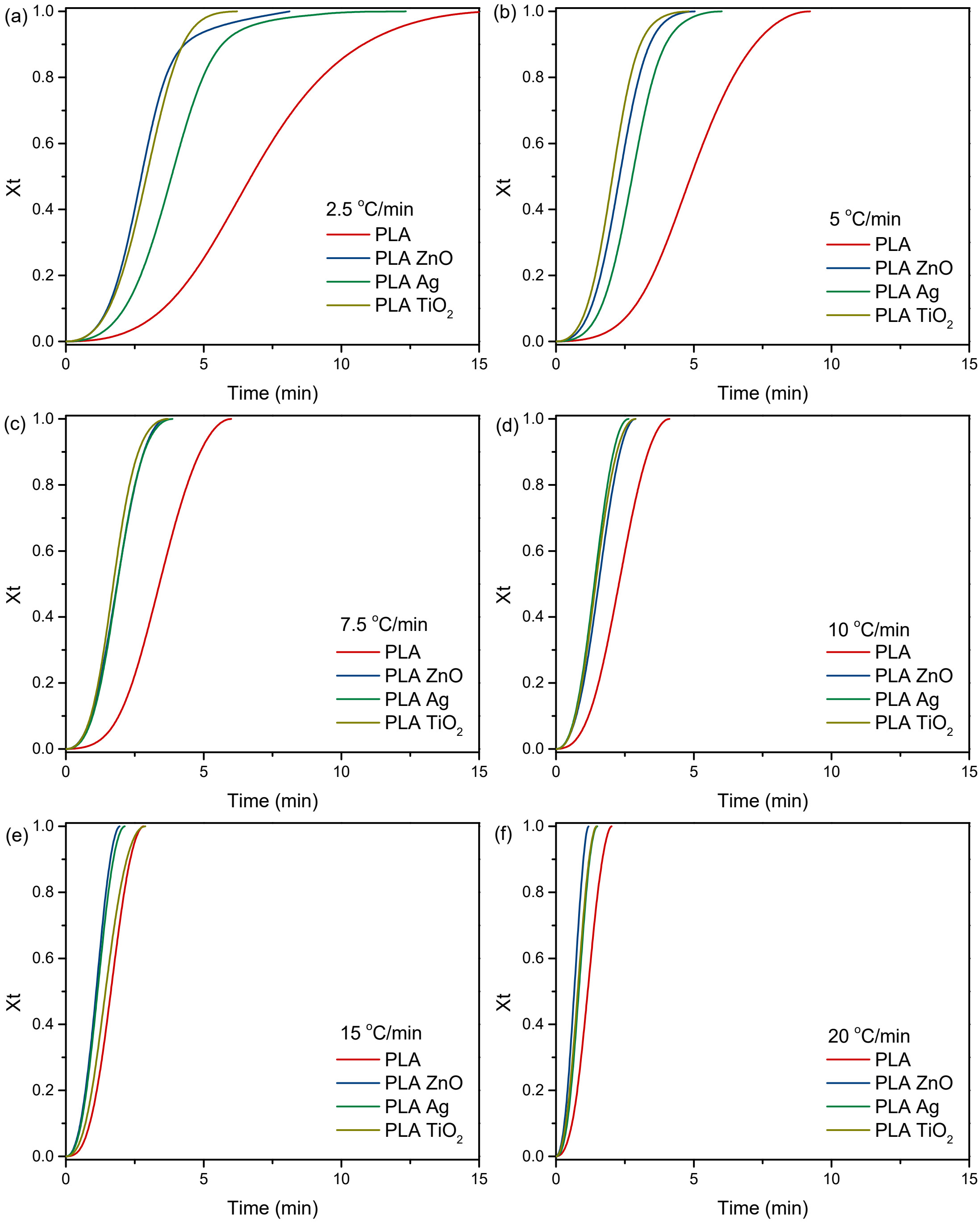

Figure S2. Relative crystallinity (X_t) as a function of time during non-isothermal cold crystallization.

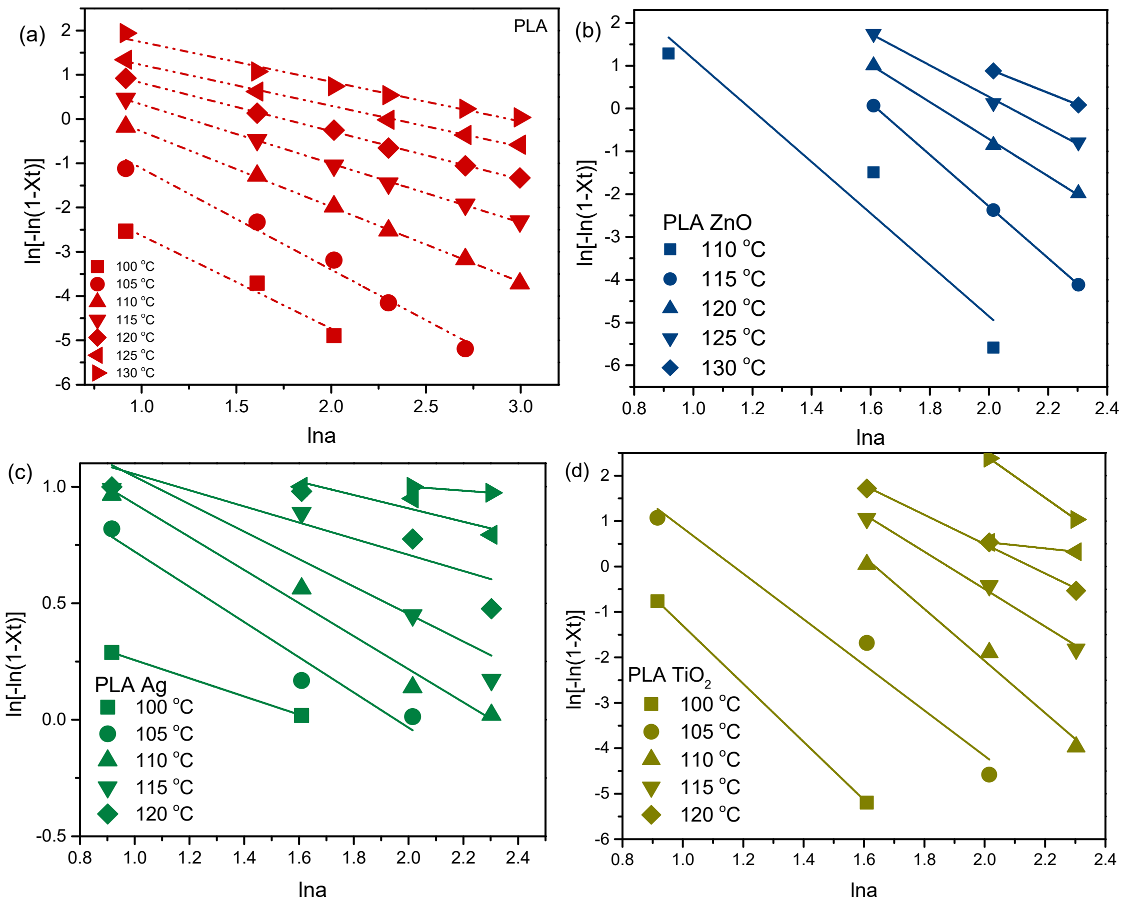

Figure S3. Ozawa plots of the non-isothermal cold crystallization of PLA and its nanocomposites.

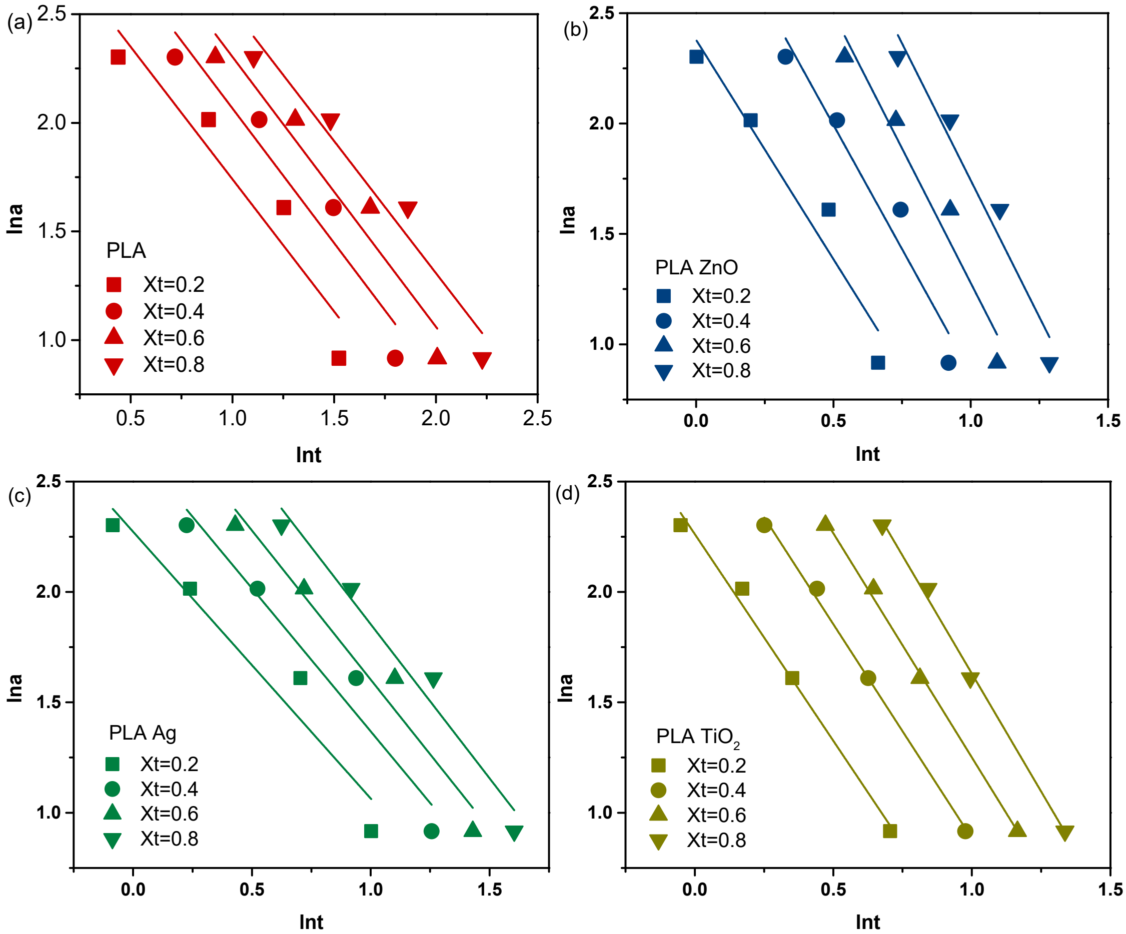

Figure S4. Mo plots of the non-isothermal cold crystallization of PLA and its nanocomposites.

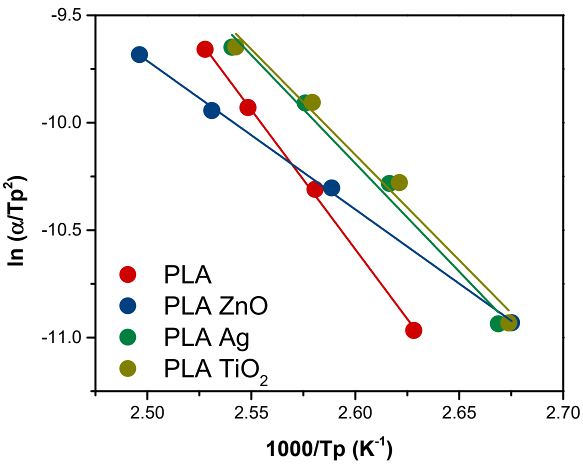

Figure S5. Kissinger plots for the non-isothermal cold crystallization of PLA and its nanocomposites.

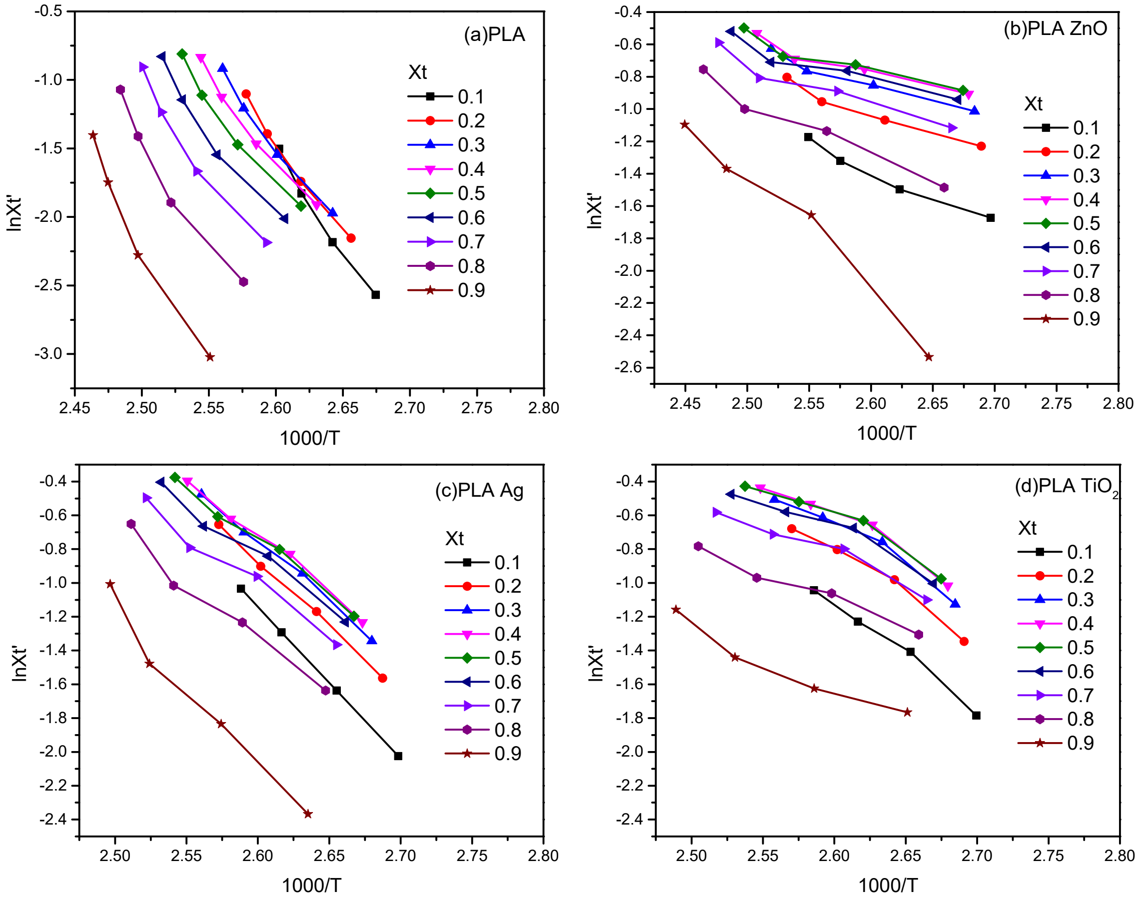

Figure S6. Friedman plots of PLA and its nanocomposites.

Table S1. Thermal characteristics of PLA and its composites obtained from the DSC scans of Figure S1.

Sample	Heating rate (°C/min)	T_g (°C)	T_{cc} (°C)	DH_{cc} (J/g)	T_{m1} (°C)	T_{m2} (°C)	DH_m (J/g)	X_c (%)
PLA	2.5	55	107.5	-26	147.2	154.9	26.9	28.9
	5	56.2	114.5	-25.6	148.4	154.1	21.4	23.0
	7.5	56.9	119.4	-15.6	149.2	-	15.3	16.5
	10	57.3	122.6	-9.8	149.7	-	10.4	11.2
	15	58.2	125.4	-3.86	150.3	-	4.5	4.8
	20	58.9	126.5	-1.7	150.5	-	2.2	2.4
PLA ZnO	2.5	54.6	100.8	-34.7	144.6	152.7	29.1	31.6
	5	54.5	113.3	-32.7	146.1	152.9	30	32.6
	7.5	55.1	122.1	-23.7	147.6	152.2	25.4	27.6
	10	55.6	127.6	-10.1	148.9	-	11.5	12.5
	15	56.1	129.6	-1.4	149.4	-	1.4	1.5
	20	56.6	132.5	-0.3	149.1	-	0.4	0.4
PLA Ag	2.5	54.9	101.7	-31.23	145.4	153.4	29.6	32.1
	5	55.8	109.2	-30.8	146.6	153.2	29.5	32.0
	7.5	57.1	115.2	-28.8	148	152.5	27.8	30.2
	10	57.4	120.6	-22.7	149.3	-	24	26.1
	15	58.2	127.1	-10.3	150.5	-	10.5	11.4
	20	59	129.4	-3	151	-	4.1	4.5
PLA TiO_2	2.5	55.0	101.0	-29.3	145.1	153.3	26.3	28.6
	5	55.9	108.5	-28.9	146.0	153.0	26.0	28.2
	7.5	56.8	114.7	-27.2	147.3	152.7	25.5	27.7
	10	57.0	120.3	-21.4	148.3	--	22.9	24.9
	15	57.8	127.8	-8.4	150.1	--	8.7	9.4
	20	58.5	130.1	-2.2	150.5	--	2.3	2.5

Table S2. Results of the Mo analysis of the non-isothermal cold crystallization of PLA and its nanocomposites.

Sample	PLA			PLA ZnO			PLA Ag			PLA TiO_2		
X_t	ln$F$(t)	b	R^2	ln$F$(t)	b	R^2	ln$F$(t)	b	R^2	ln$F$(t)	b	R^2
0.2	2.96	1.22	0.86368	2.38	1.99	0.91251	2.27	1.21	0.91319	2.26	1.87	0.98734
0.4	3.31	1.24	0.89586	3.12	2.25	0.92377	2.67	1.30	0.93622	2.82	1.94	0.99504
0.6	3.55	1.24	0.91649	3.72	2.44	0.92741	2.96	1.35	0.94745	3.28	2.03	0.99618
0.8	3.74	1.21	0.93642	4.22	2.48	0.93512	3.25	1.40	0.95542	3.77	2.14	0.99512