Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Perovskite $La_{0.75}Sr_{0.25}Cr_{0.5}Mn_{0.5}O_{3-\delta}$ Sensitized SnO_2 Fiber-in-Tube Scaffold: Highly Selective and Sensitive Formaldehyde Sensing

*By Joon-Young Kang, Ji–Soo Jang, Won-Tae Koo, Jongsu Seo, Yoonseok Choi, Min-Hyeok Kim, Dong-Ha Kim, Hee-Jin Cho, WooChul Jung and Il–Doo Kim**

Contents

10. XPS spectra of O 1*s* of LCO and LSCM particles and spectra feature table of O 1*s*.

11. Resistance variation graph of LSCM particles during 1-5 ppm of formaldehyde exposure.

Table 1. Resistance values of LSCM@SnO_2 FITs before and after injection of formaldehyde gas.

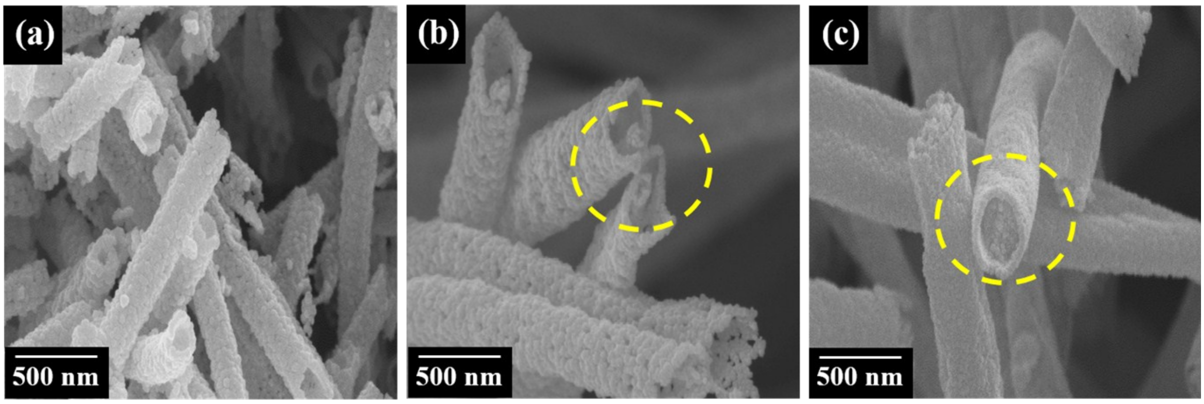


Fig. S1. SEM image of a) pristine SnO_2 NTs, b) 2.5 wt%-, and c) 30 wt% LSCM@SnO_2 FITs.

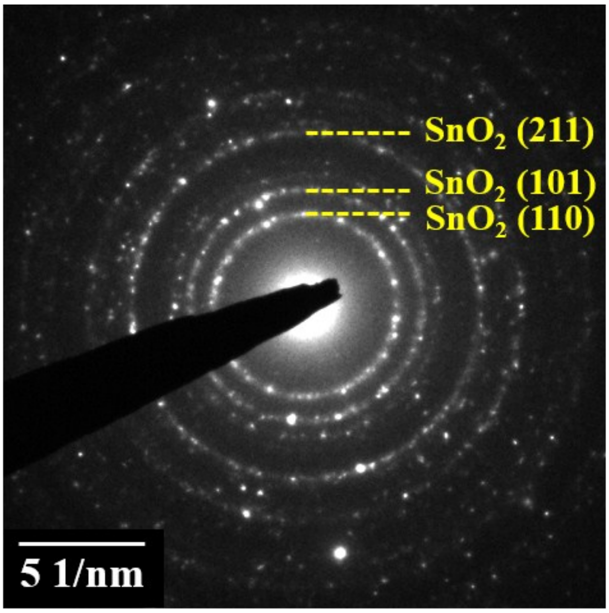


Fig. S2. SAED pattern of LSCM@SnO_2 FITs.

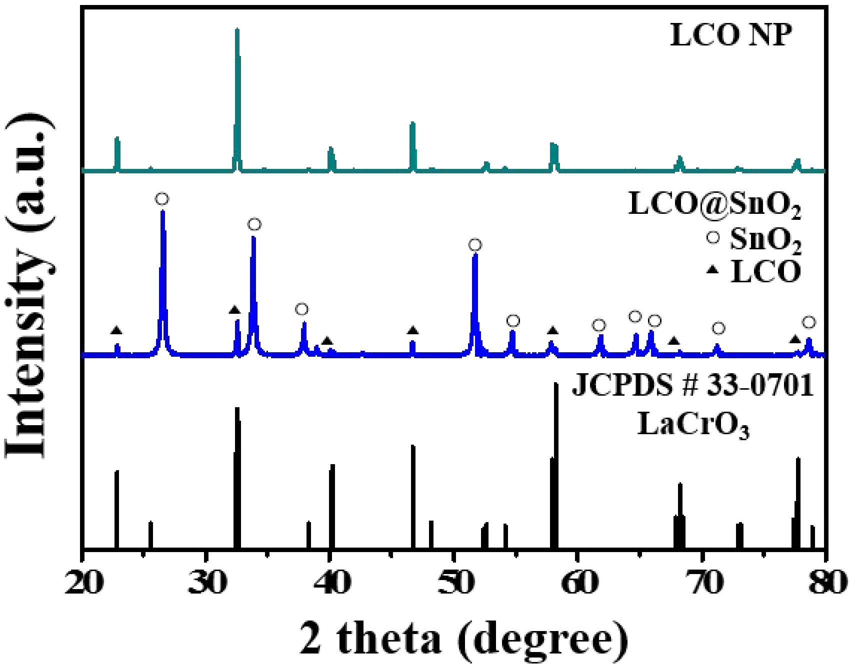


Fig. S3. XRD analysis data of LCO particles and LCO@SnO_2 FITs.

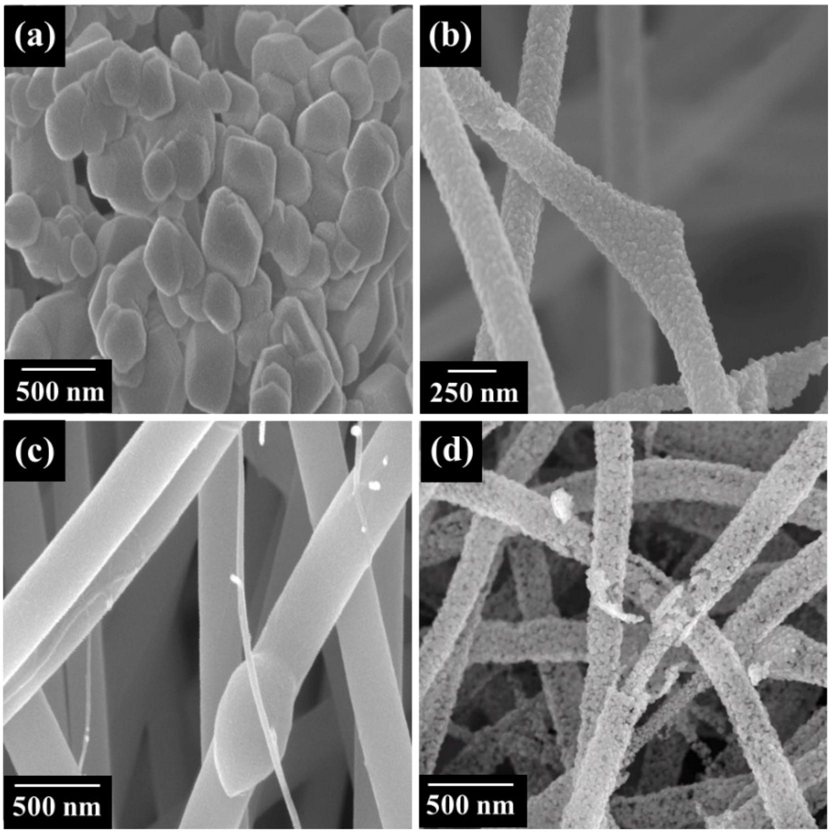


Fig. S4. SEM image of a) LCO particles, b) LSCM@SnO_2 NFs, c) as-spun LCO@PVP/Sn NFs and d) LCO@SnO_2 FITs.

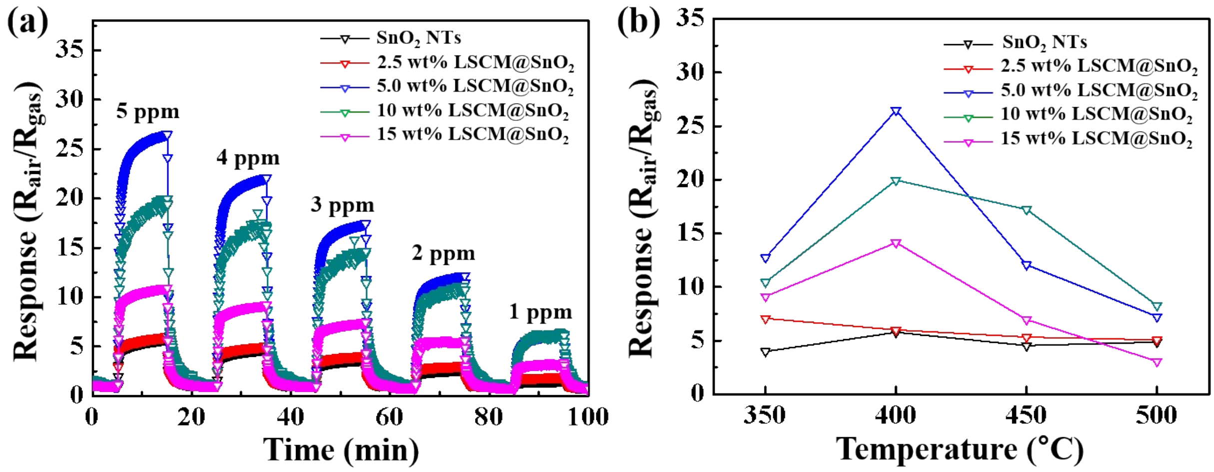


Fig. S5. a) Formaldehyde sensing tests at 400 °C as a function of loading amount of LSCM particles and b) temperature-dependent sensing tests toward 5 ppm of formaldehyde.

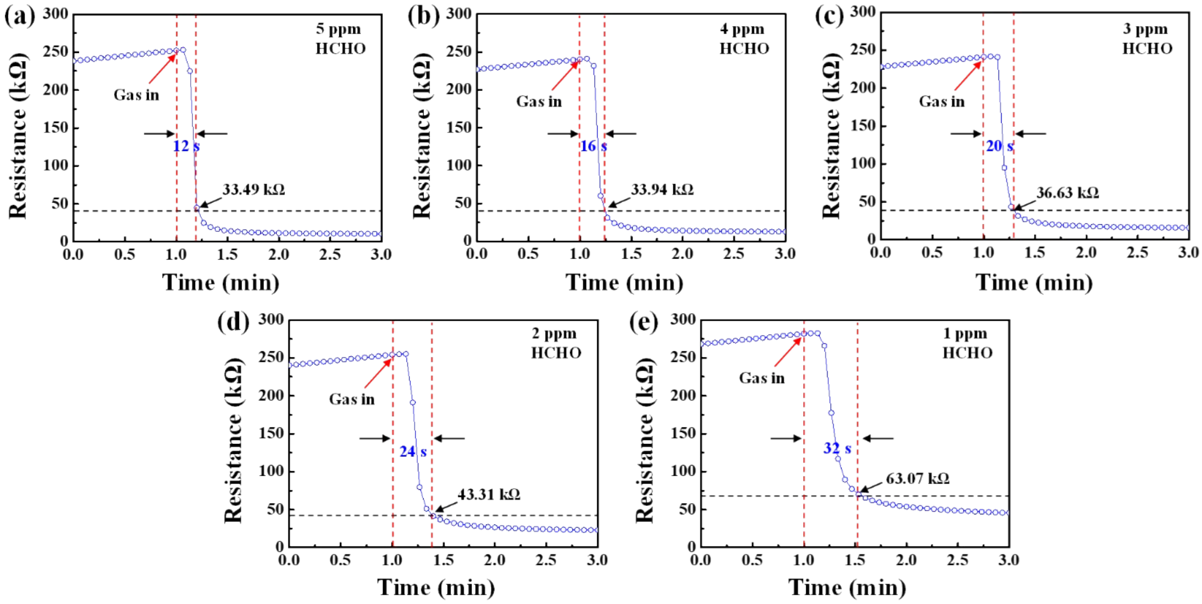


Fig. S6. Resistance variation graphs and response times of LSCM@SnO_2 FITs towards a) 5 ppm, b) 4 ppm, c) 3 ppm, d) 2 ppm, and e) 1 ppm of formaldehyde gases.

The response time is defined as the time taken for the resistance to decrease by 90% of maximum resistance difference (R_{air}-R_{gas}) after injecting reducing gases. In case of 5 ppm formaldehyde exposure, R_{air} and R_{gas} are 253.03 kΩ and 9.10 kΩ, respectively. Therefore, 90% of R_{air}-R_{gas} is 219.54 kΩ, and the response time is the time taken for the resistance to decrease 253.03 kΩ to 33.49 kΩ (253.03-219.54 kΩ). As indicated in Fig. S6a, the response time o1f LSCM@SnO_2 FITs is 12 s, in case of 5 ppm formaldehyde exposure. The same calculation method is applied to 4, 3, 2, and 1 ppm of formaldehyde exposure, and to the control samples (pristine SnO_2 NFs, SnO_2 NTs, LSCM@SnO_2 NFs, and LCO@SnO_2 FITs).

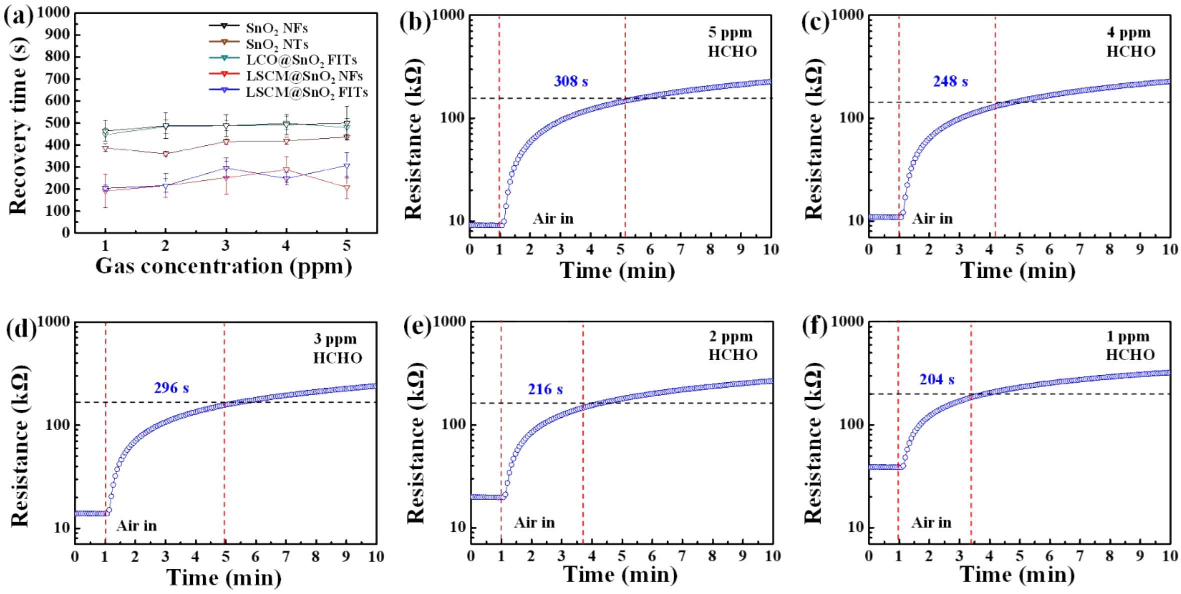


Fig. S7. a) Recovery times of SnO_2 NFs, SnO_2 NTs, LCO@SnO_2 NFs, LSCM@SnO_2 NFs, and LSCM@SnO_2 FITs in the concentration range of 1–5 ppm. b-f) Resistance variation of LSCM@SnO_2 FITs after injection of air and recovery times in the concentration of 1-5 ppm of formaldehyde.

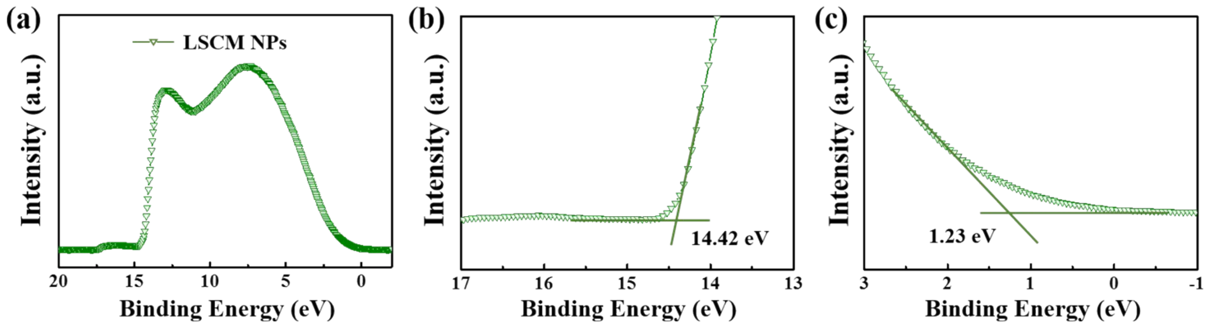


Figure S8. UPS analysis of LSCM particles.

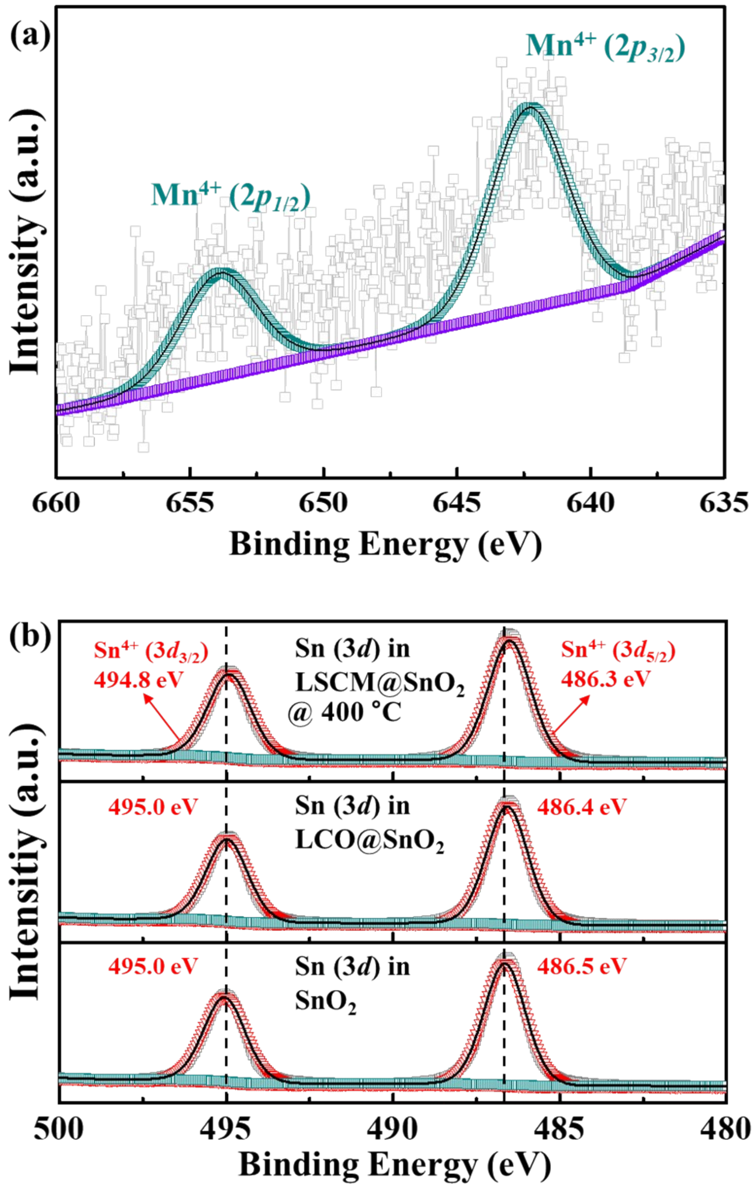
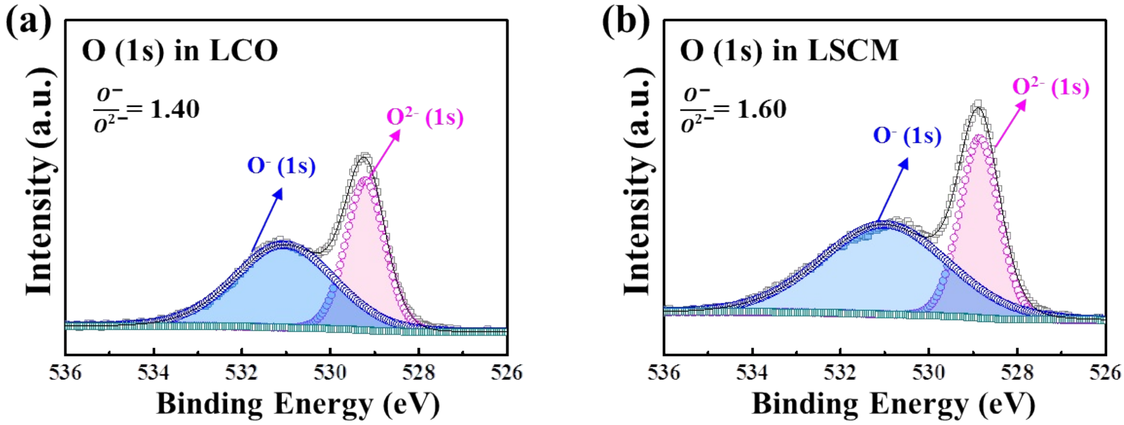


Figure S9. XPS spectra of (a) Mn 2p of pristine LSCM particles and (b) Sn 3*d* of LSCM@SnO_2 FITs after heating at 400 °C.



(c)

Element / Transition	Peak Energy (eV)	Peak Area (eV counts)
O^{2-} (1s) in LCO	529.9	30649.50
O^{-} (1s) in LCO	531.0	43333.92
O^{2-} (1s) in LSCM	529.9	36083.30
O^{-} (1s) in LSCM	531.0	57832.79

Figure S10. XPS spectra of O 1*s* of a) LCO and b) LSCM particles and c) spectra feature table of O 1*s*.

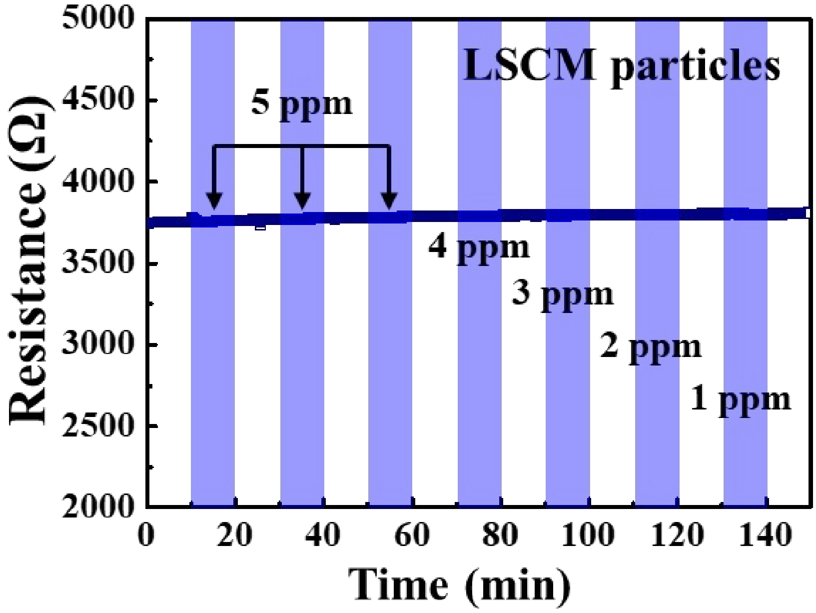


Figure S11. Resistance variation graph of LSCM particles toward 1-5 ppm of formaldehyde.

Table S1. Resistance values of LSCM@SnO_2 FITs before and after injection of formaldehyde gas.

Gas concentration (ppm)	Resistance (kΩ)								
	R_{air} (0 s)	R_{gas} (4s)	8 s	12 s	16 s	20 s	24 s	28 s	32 s
	HCHO injection								
5	253.03	225.13	44.94	24.94	19.31	16.60	15.01	14.00	13.31
4	240.28	241.00	231.61	60.03	30.99	23.85	20.47	18.54	17.24
3	240.99	241.80	240.80	95.00	43.55	31.49	27.03	24.37	22.62
2	254.07	254.90	255.06	191.07	79.44	51.06	41.35	36.71	34.08
1	282.27	282.39	177.35	116.89	89.53	77.06	69.79	65.17	61.94