Supplementary Information

Understanding the Solvent Molecules Induced Spontaneous Growth of Uncapped Tellurium Nanoparticles

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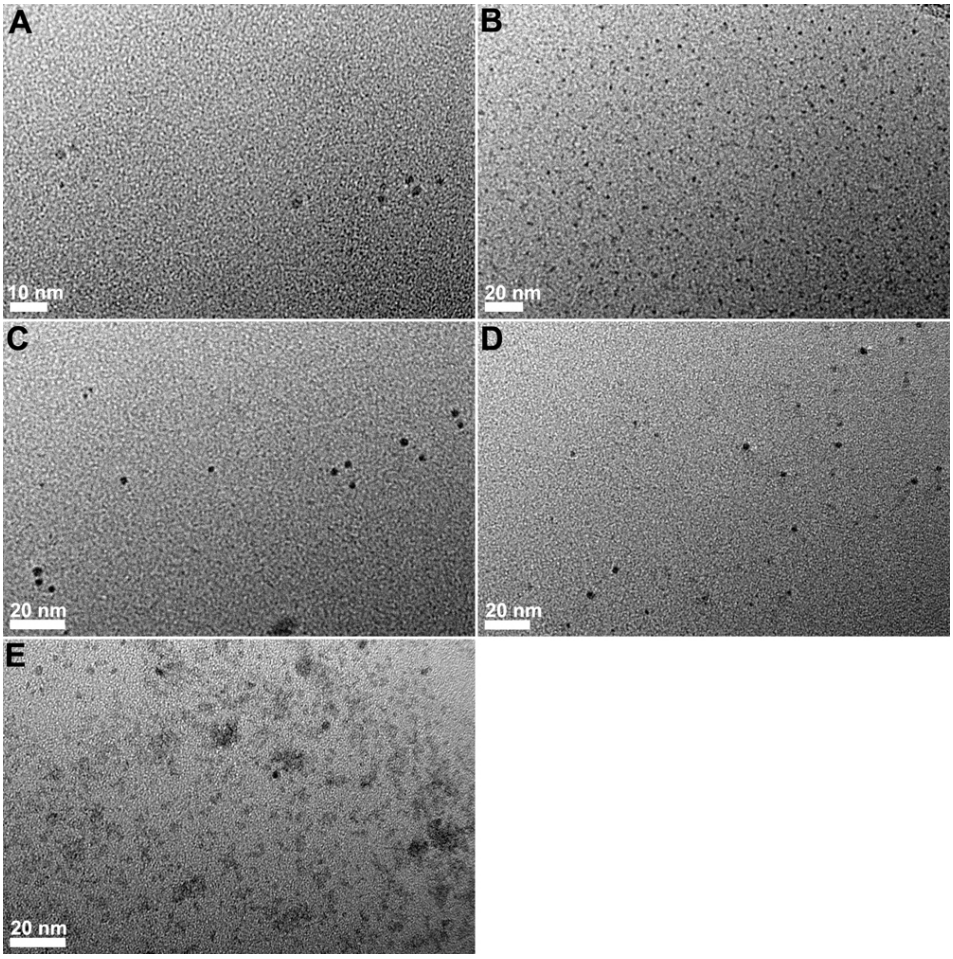

Figure S1 TEM images of uncapped Te nanoparticles generated in H_2O (A), CH_3OH (B), CH_3CH_2OH (C), CH_3COCH_3 (D) and CH_2Cl_2 (E), respectively

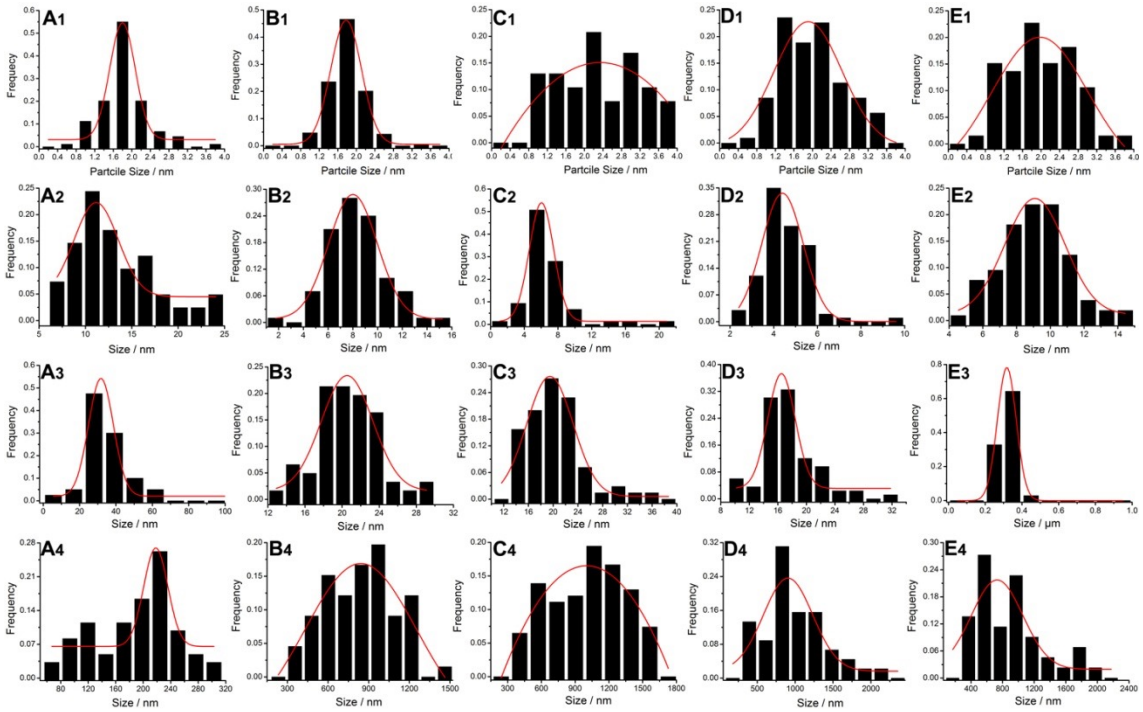

Figure S2 Size distribution histograms of uncapped Te nanoparticles (A_1-E_1), nanochains (A_2-E_2), agglomerates (A_3-E_3) and microspheres (A_4-E_4) generated in H_2O, CH_3OH, CH_3CH_2OH, CH_3COCH_3 and CH_2Cl_2, respectively.

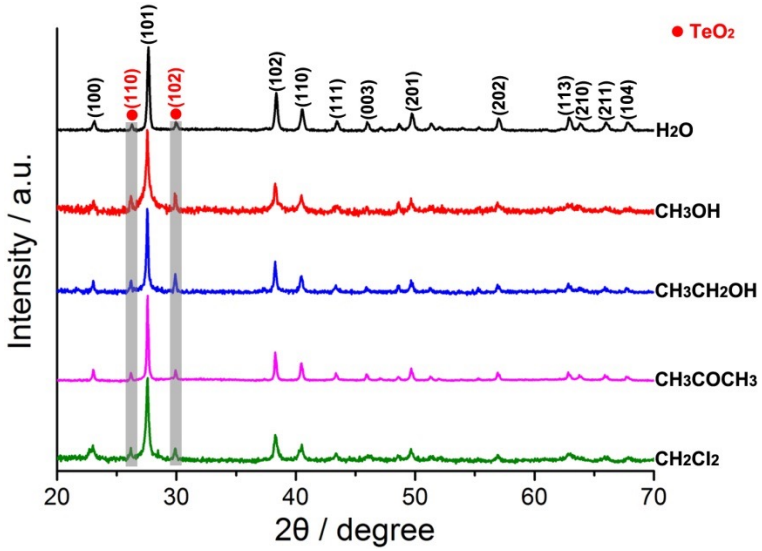

Figure S3 XRD patterns of Te nanochains formed in H_2O, CH_3OH, CH_3CH_2OH, CH_3COCH_3 and CH_2Cl_2. Red dots marked peaks indexed to TeO_2.

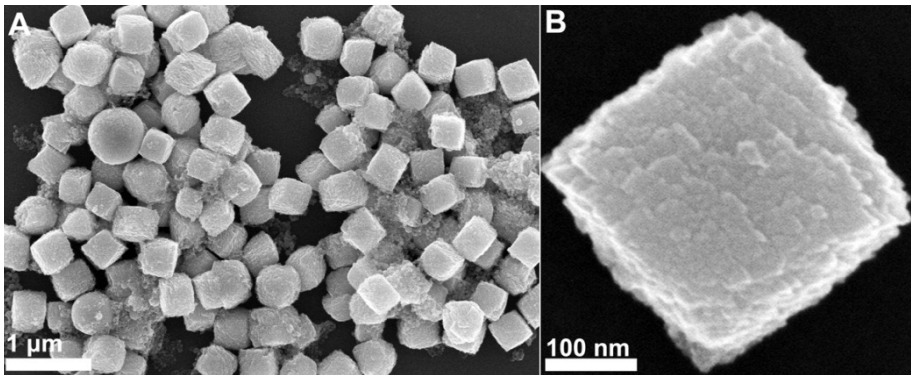

Figure S4 Low- and high magnification SEM images of Te nanocubes formed in CH_2Cl_2.

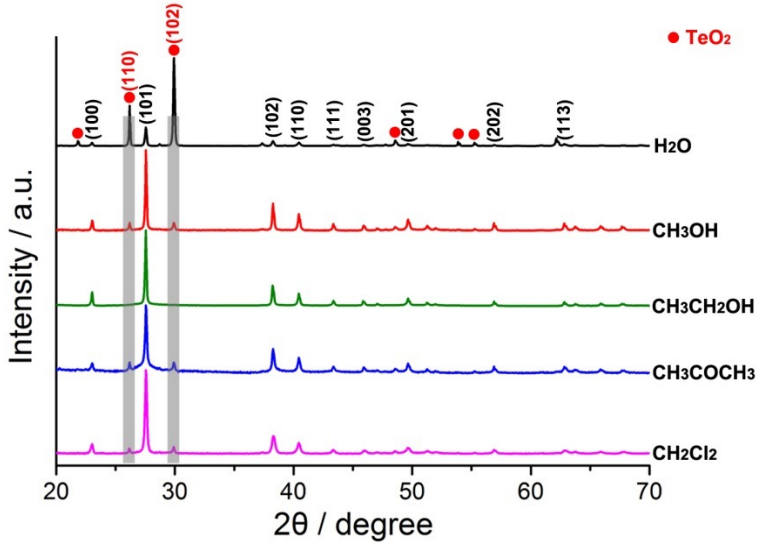

Figure S5 XRD patterns of Te microspheres generated in H_2O, CH_3OH, CH_3CH_2OH, CH_3COCH_3 and CH_2Cl_2. Red dots marked peaks indexed to TeO_2.

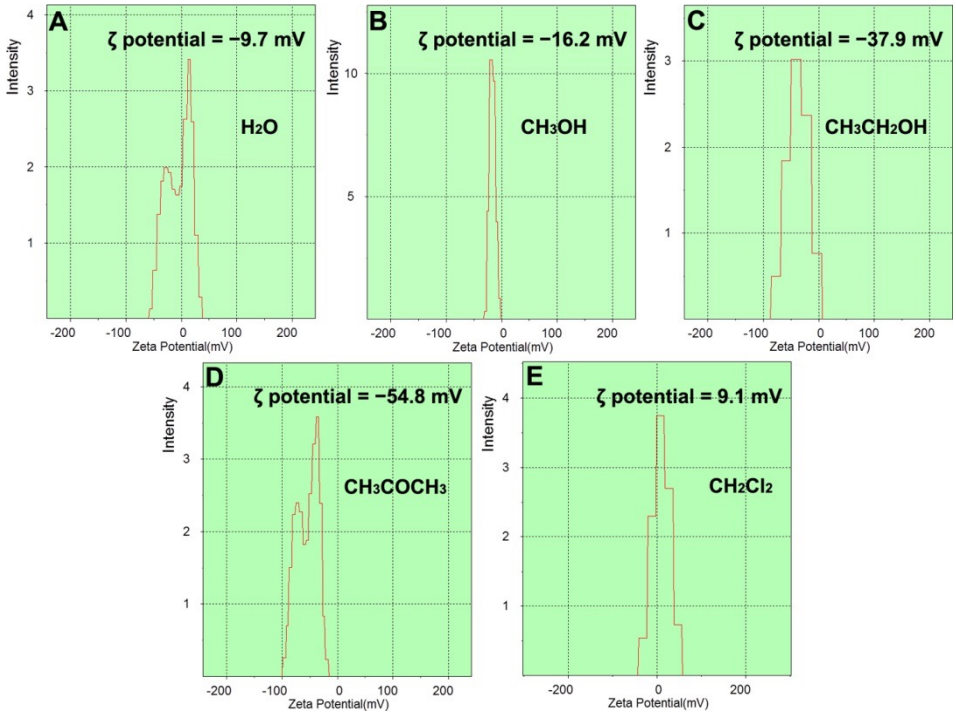

Figure S6 Zeta potential of Te nanochains colloidal solution in various solvents: H_2O (A), CH_3OH (B), CH_3CH_2OH (C), CH_3COCH_3 (D) and CH_2Cl_2 (E) in sequence.

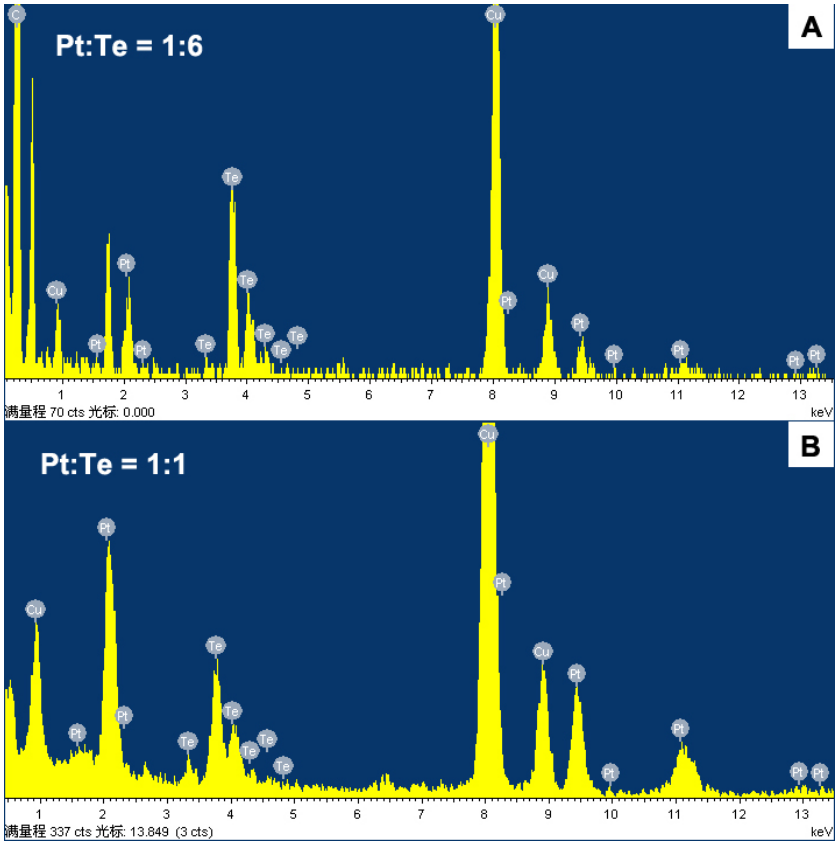

Figure S7 EDX spectra of Pt located Te nanoparticles and Pt-Te hybrid structures.

Table S1* Concentration of initial Te nanoparticles colloidal solution in five kinds of solvents, which was performed by Inductively Coupled Plasma Mass Spectrometer (ICP).

Solvents	Concentration of Te nanoparticles colloidal solution (mg/L)

Solvents	1	2	3	Average value	Standard Deviation
H_2O	24.11	24.11	24.22	24.15	0.052
CH_3OH	24.93	25.00	25.22	25.05	0.123
CH_3CH_2OH	26.00	25.14	25.91	25.68	0.386
CH_3COCH_3	25.67	25.69	25.81	25.72	0.062
CH_2Cl_2	24.20	24.90	24.71	24.60	0.296

*Note: Laser ablation in liquids is a special method for preparing colloidal solution, the concentration of colloidal solution is strongly correlated with laser parameters, including wavelength of pulse laser, pulse laser energy (or fluence), ablation time, volume of liquids. In our experiment, the Te target was immersed in 15 mL of solvents and ablated using a 1064 nm Nd: YAG pulse laser with a pulse duration of 10 ns and pulse energy of 30 mJ to obtain Te nanoparticles. Under room temperature and pressure, the Te nanoparticles in various solvents obtained with same ablation time show the same initial concentrations.

Table S2 *Average size and standard deviation (σ) of uncapped Te nanoparticles, nanochains, agglomerates and microspheres generated in H_2O, CH_3OH, CH_3CH_2OH, CH_3COCH_3 and CH_2Cl_2.

solvents	nanoparticles		nanchains		agglomerates		microspheres	
	average size	σ	average size	σ	average size	σ	average size	σ
H_2O	1.79	0.50	12.97	4.34	34.16	11.19	190.07	58.51
CH_3OH	1.78	0.38	8.24	2.23	20.53	3.33	840.14	254.83
CH_3CH_2OH	2.31	0.86	6.67	2.81	20.29	4.49	1006.35	332.94
CH_3COCH_3	2.00	0.66	4.48	1.05	17.31	3.82	990.37	409.06
CH_2Cl_2	2.00	0.70	9.08	1.98	320.00	51.69	885.60	419.89

*Note: The average size and standard deviation of different Te nanostructures was collected on the basis of the calculation and fitting of over hundreds of Te nanostructures from dozens of TEM or SEM images. The unit of average size and standard deviation are both nanometers (nm).

Table S3 Growth rate of Te nanchains, agglomerated and microspheres in various solvents. Formation of Te nanochains by OA mechanism was designed as Stage 1, generation of Te agglomerates and microspheres was designed as Stage 2 and Stage 3, respectively. The corresponding growth rate of different Stage (GS) was calculated by Δaverage size/ Δtime (nm/hour) and defined as GS_1, GS_2 and GS_3, respectively. To make convenient comparison, the value of GS_1 and GS_3 was both took the natural logarithm. For drawing related column bar graph, the value of GS_2 multiplies by 100 and then took the natural logarithm.

solvents	$\ln(GS_1)$	$\ln(GS_2)$	$\ln(GS_2\times100)$	$\ln(GS_3)$
H_2O	8.52	3.06	7.66	1.91
CH_3OH	4.87	−0.67	3.94	1.74
CH_3CH_2OH	3.49	−1.95	2.65	1.41
CH_3COCH_3	3.92	−2.57	2.03	1.06
CH_2Cl_2	3.35	4.16	8.77	0.54

Table S4 Fundamental physicochemical properties of different solvents, including H_2O, CH_3OH, CH_3CH_2OH, CH_3COCH_3 and CH_2Cl_2.

solvents	polarity	dielectric constant	dipole moment (Debye)	viscosity (cp 20°C)
H_2O	10.2	80	1.85	1.0
CH_3OH	6.6	33	1.7	0.6
CH_3CH_2OH	4.3	24.3	1.69	1.2
CH_3COCH_3	5.4	20.7	2.88	0.32
CH_2Cl_2	3.4	9.08	1.6	0.44