

Supplementary Materials

CrPS₄ Nanoflakes as Stable Direct-Band-Gap 2D Materials for Ultrafast Pulse Laser Applications

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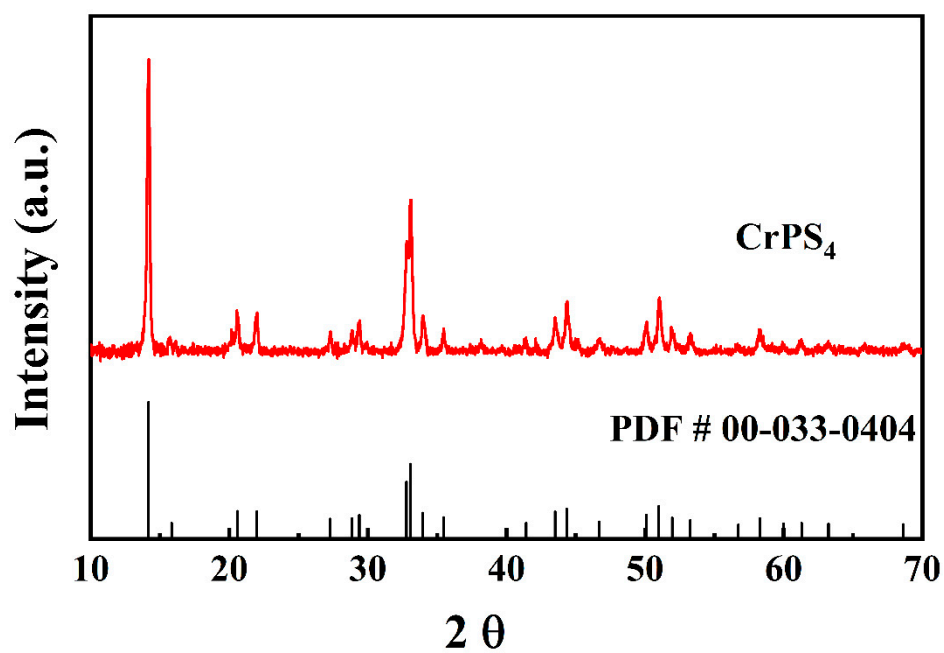


Figure S1. The diffraction pattern from CrPS_4 sample was analyzed using X'pert Highscore Plus 3.0

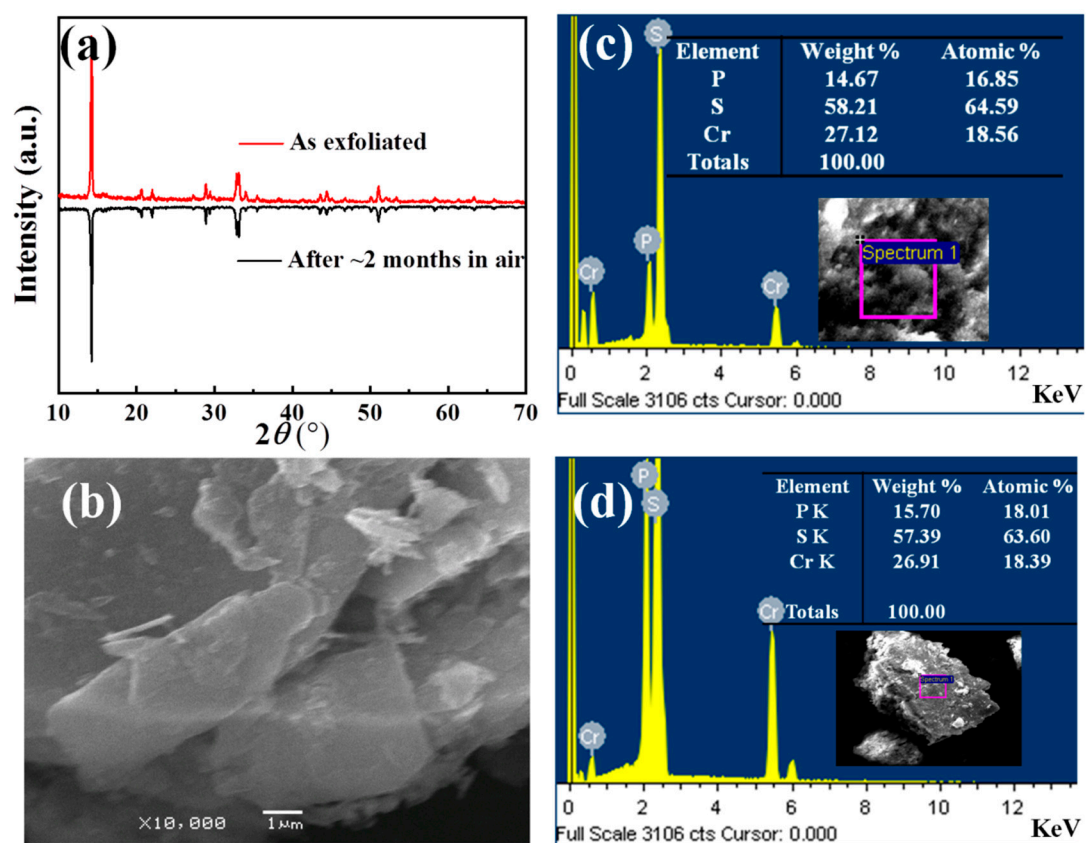


Figure S2. (a) XRD spectra of CrPS₄ as exfoliated and after ~2 months in air; (b) SEM image for CrPS₄ flakes after ~2 months in air; (d) EDX spectra with an atomic ratio of Cr, P and S elements for CrPS₄ flakes as exfoliated and after ~2 months in air.

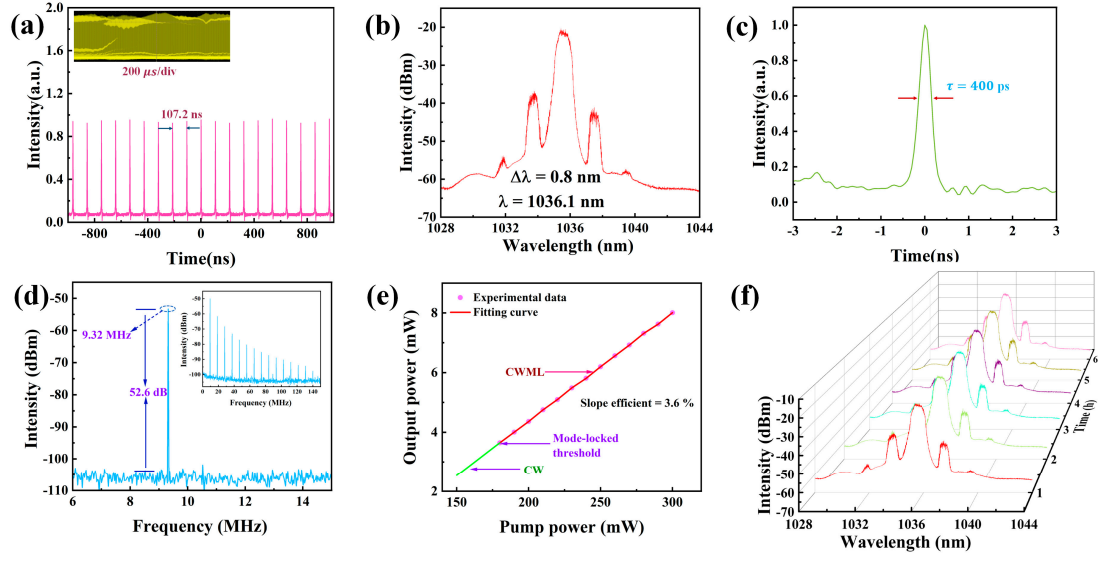


Figure S3. Classical mode-locked output characteristics. (a) Pulse train; (b) Optical Spectrum; (c) Pulse width; (d) RF spectrum (inset: broadband RF spectrum); (e) Relative change of output power and pump power; (f) Long-time spectroscopic measurement (1 hour interval, 6 hours in total).

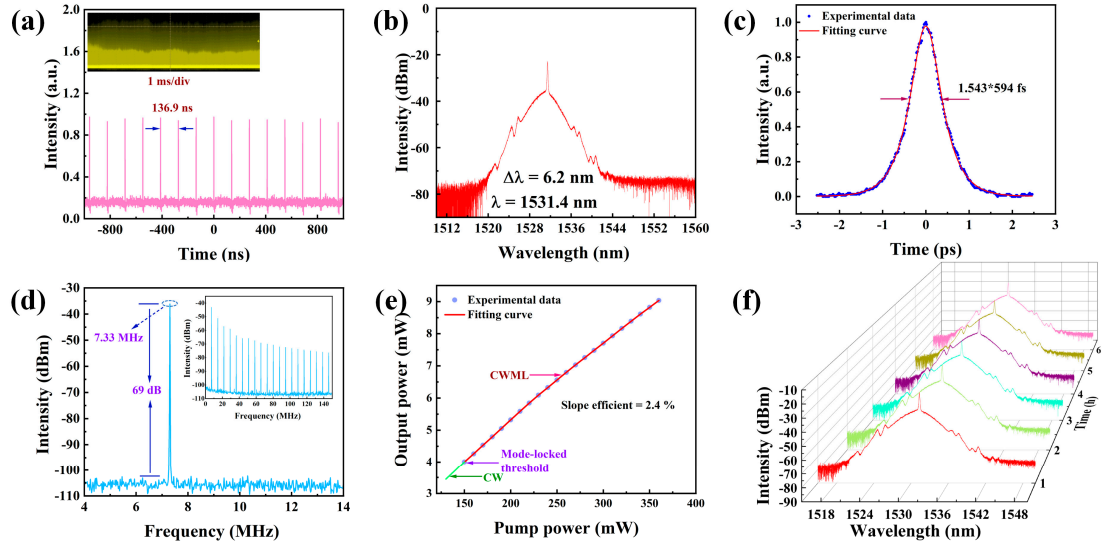


Figure S4. Classical mode-locked output characteristics. (a) Pulse train; (b) Optical Spectrum; (c) Pulse width; (d) RF spectrum (inset: broadband RF spectrum); (e) Relative change of output power and pump power; (f) Long-time spectroscopic measurement (1 hour interval, 6 hours in total).

Table S1. Comparison of SA with other 2D materials at 1 μm laser output parameters.

SA type	Pulse width (ps)	Output power(mW)	Pulse energy(nJ)	Peak power(W)	Ref.
Graphene	580	0.37	0.41	0.71	[54]
Graphene oxide	2300	0.19	0.18	0.08	[64]
BP	3.2	27	2.7	830	[65]
BP	400	32.5	0.7	1.75	[66]
Ti ₃ C ₂ T _x	480	9	0.47	1	[67]
WS ₂	630	7.6	1.36	2.14	[56]
Mo ₂ C	350	7.7	0.38	1.09	[55]
MoSe ₂	664.5	2	0.13	0.19	[68]
MoS ₂	656	2.37	0.35	0.53	[69]
MoS ₂	800	9.3	1.41	1.76	[70]
Bi ₂ Te ₃	230	0.86	0.60	2.6	[53]
CrPS ₄	298	10.63	1.174	3.94	This work

Table S2. Comparison of SA with other 2D materials at 1.5 μm laser output parameters.

SA type	Pulse width (fs)	Output power(mW)	Pulse energy(pJ)	Peak power(W)	Ref.
Graphene	756	2	1120	1478	[7]
BP	2180	0.077	4.9	2.3	[71]
BP	940	2.6	1129	1201	[57]
Ti ₃ CNT _x	159	3	410	2578.6	[67]
Ti ₃ CNT _x	660	0.05	3	4.9	[72]
MoS ₂	200	1	68.8	2300	[73]
MoS ₂	521	0.79	31.3	60.1	[74]
WS ₂	21100	1.8	220	10.4	[56]
Mo ₂ C	290	6.831	860	2982	[55]
In ₂ Se ₃	215	2	270	1255.8	[75]
CrPS ₄	500	6.1	893	1786	This work