Supplementary Information

Strong near-infrared nonlinear optical response in nanocrystalline TiN for pulse generation

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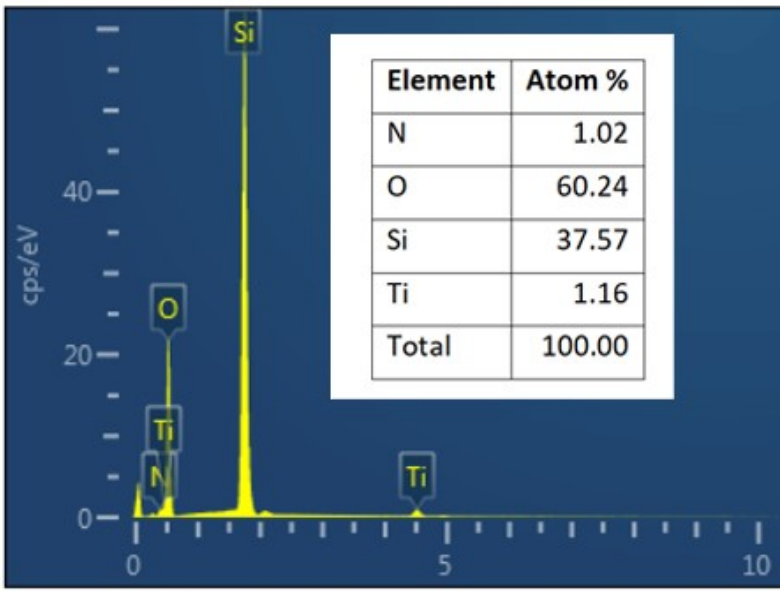

Figure S1: Energy dispersive X-ray spectrum of the sputtered nc-TiN.

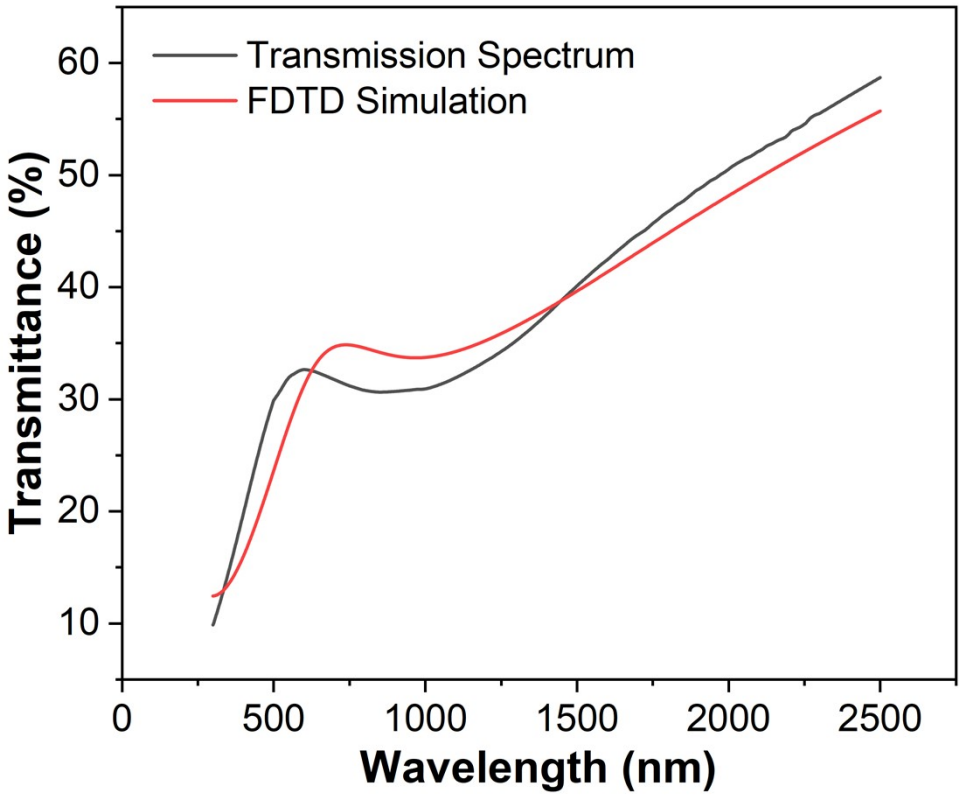

Figure S2: Comparison of FDTD-simulated and experimental transmission spectra of the nc-TiN film.

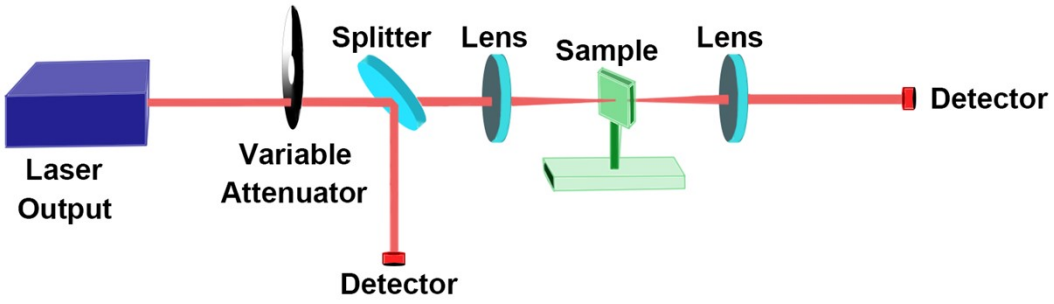

Figure S3: Schematic of the open-aperture Z-scan setup.

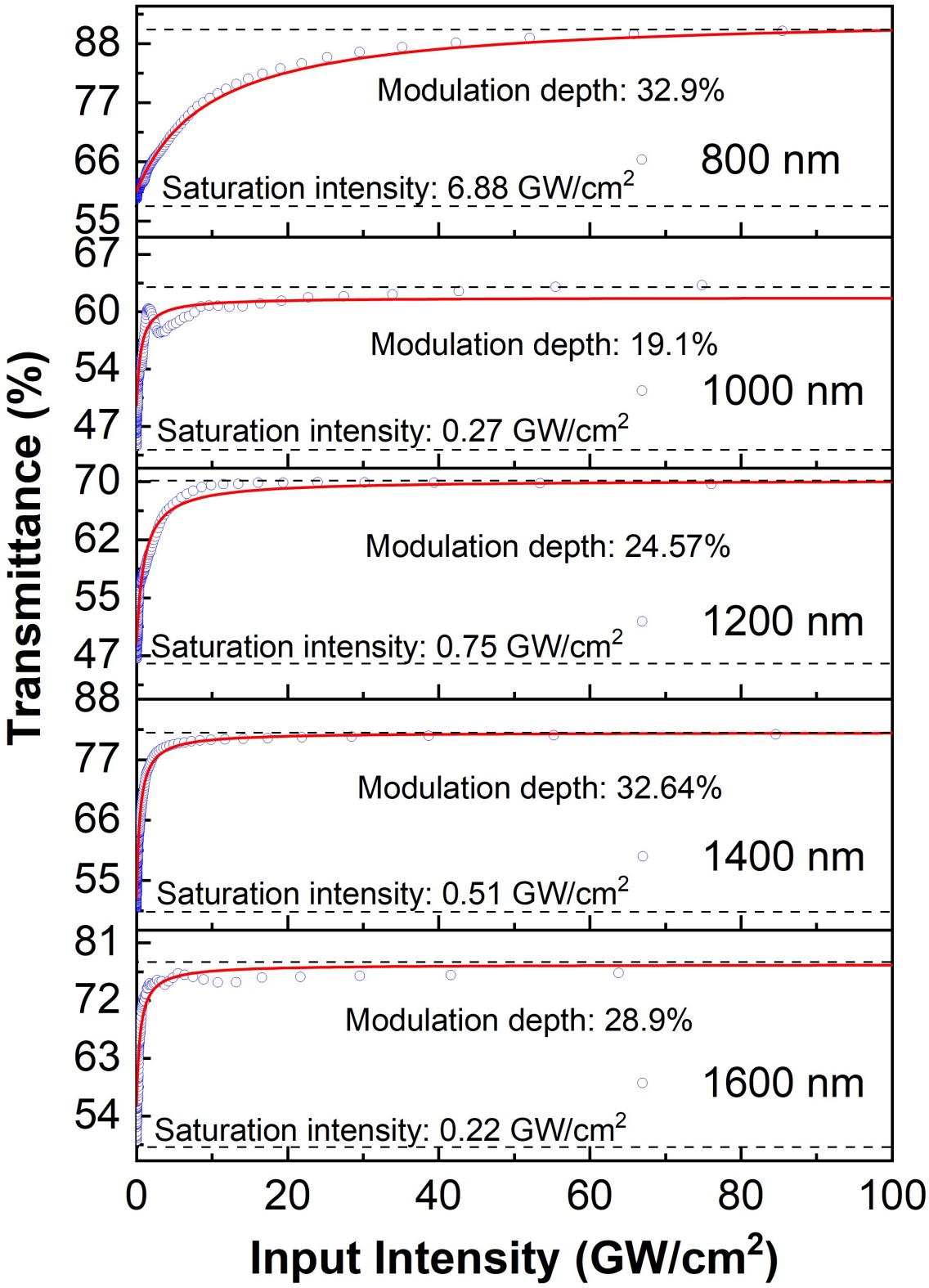

Figure S4: Modulation depth at different wavelengths.

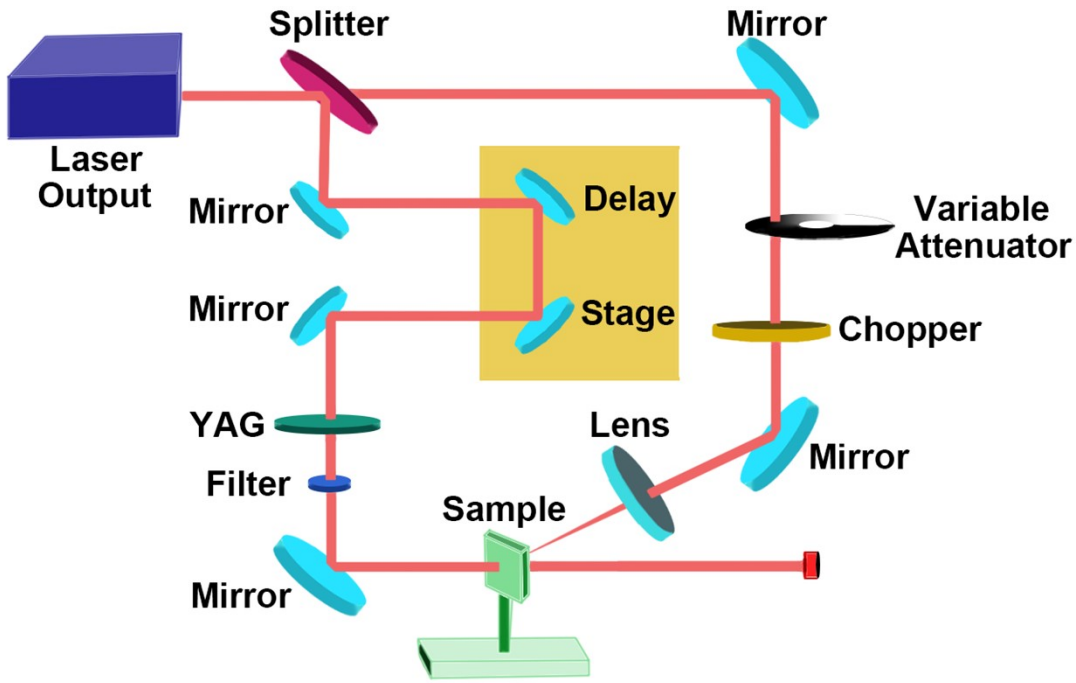

Figure S5: Schematic of the pump-probe set-up for the measurement of transient absorption spectrum.

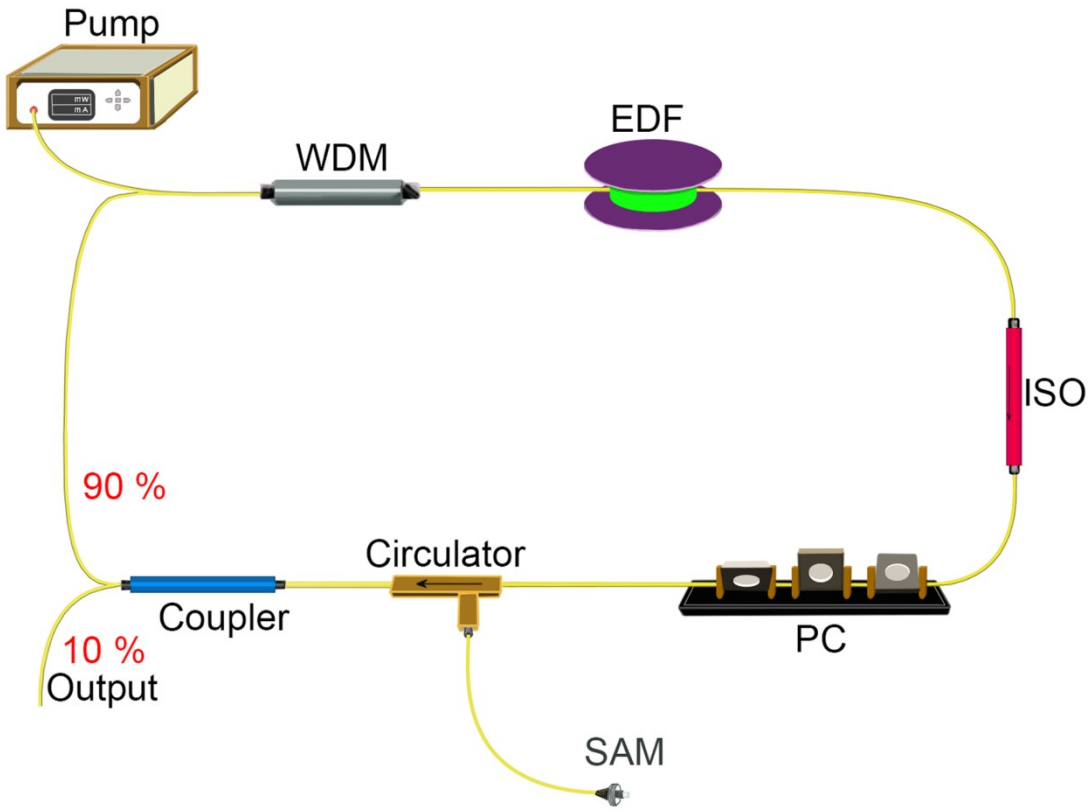

Figure S6: Schematic illustration of the fiber laser cavity employing a reflective saturable absorber based on nc-TiN.

Table S1: Comparison of nonlinear optical parameters of several typical SA materials

Material	Measurement wavelength	Nonlinear absorption coefficient(β)	Saturable intensity	Modulation depth	Reference
Monolayer graphene	1550 nm	-100 cm/GW	<0.06 GW/cm^2	<1.5%	1,2
Mo_2C (Thickness ~15 nm)	1550 nm	-9×10^3 cm/GW	0.18 GW/cm^2	8.6%	3
Pristine MoO_3 nanosheets	800 nm	-16.74 cm/GW	20.77 GW/cm^2	19.31%	4
Plasmonic MoO_3 nanosheets	800 nm	-33.24 cm/GW	21.94 GW/cm^2	34.96%	4
Black phosphorus	1550 nm	$-0.15\text{x}10^{-3}$ cm/GW			5
MoS_2	800 nm	$-4.6\text{x}10^{-3}$ cm/GW			6
ITO NCs	1500 nm	-51.4 cm/GW			7
TiN NCs	1550 nm	-37.1 cm/GW	125 GW/cm^2	10.77%	8
Au NPs embedded $LiNbO_3$ crystal	1064 nm	-24.2 cm/GW	98.14 GW/cm^2		9
nc-TiN film	1550 nm	-35.07 cm/GW	4.26 GW/cm^2	16.7%	This work

Table S2: Performance summary of mode-locked lasers based on typical SA materials.

Material	Center wavelength	3-dB bandwidth	Repetition rate	Output power	Reference
Monolayer graphene	1559 nm	5.24 nm	19.9 MHz	22 mW	10
ITO	1558 nm	0.27 nm	1.96 MHz		11
Sb_2Te_3	1565 nm	30 nm	22.32 MHz	1 mW	12
Bi_2Se_3	1558 nm	4.3 nm	12.5 MHz	1.8 mW	13
Bi_2Te_3	1556 nm	4.5 nm	14.07 MHz	1.3 mW	14
MoS_2	1569 nm	2.6 nm	8.288 MHz	5.1 mW	15
$MoSe_2$	1556 nm	5.4 nm	15.38 MHz	0.23 mW	16
Black phosphorus	1561 nm	6.4 nm	6.88 MHz	5.1 mW	17
nc-TiN film	1559 nm	1.8 nm	5.0 MHz	13.8 mW	This work

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