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

Supporting Information

Ultrafast laser pulses (115 fs) generation by using the direct bandgap ultrasmall GaTe Quantum Dots

Hui Long [#1], Yihuan Shi [#2], Qiao Wen[*2], Yuen Hong Tsang[*1]

[1]*Department of Applied Physics and Materials Research Center, The Hong Kong Polytechnic University, Kowloon, Hong Kong, China*

[2]*Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen University, Shenzhen 518060, China.*

*† These authors contributed equally to this work. * Correspondence and requests for materials should be addressed to Y. H. Tsang (email: yuen.tsang@polyu.edu.hk)or to Q. Wen (email: wenqiao@szu.edu.cn).*

Saturable absorber	Laser Type	Laser Properties					Ref.
		Wavelength	Bandwidth	Repetition rate	Pulse duration	Threshold power	
Black Phosphorus QDs	T/HDFL	1898 nm	3.9 nm	19.2 MHz	1.58 ps	150 mW	[1]
	EDFL	1567.5 nm	2.4 nm	15.22 MHz	1.08 ps	50 mW	[2]
	EDFL	1562.8 nm	10.7 nm	1036 MHz	291 fs	50 mW	[3]
	EDFL	1561.7 nm	3.0 nm	5.47 MHz	882 fs	N.A.	[4]
CdSe QDs	EDFL	1561.1 nm	0.7 nm	1 MHz	459 ns	113 mW	[5]
	YDFL	1090 nm	0.5 nm	14.5 MHz	3.5 ps	310 mW	[6]
$CsPbBr_3$ QDs	EDFL	1600 nm	4.5 nm	8.528 MHz	14.4 ps	110 mW	[7]
PbSe QDs	YDFL	1068 nm	4.5 nm	8.3 MHz	70 ps	110 mW	[8]
PbS/CdS core/shell QDs	EDFL	1562.5 nm	2.504 nm	3.302 MHz	54 ps	N.A.	[9]
PbS QDs	EDFL	1563 nm	4.7 nm	13.9 MHz	559 fs	50 mW	[10]
$NbSe_2$ QDs	EDFL	1556 nm	2.45 nm	7.7 MHz	756 fs	15 mW	[11]
	YDFL	1033 nm	0.155 nm	12.3 MHz	380 ps	175 mW	
GaTe QDs	EDFL	1530 nm	18.1 nm	8.79 MHz	115 fs	144 mW	this work
	YDFL	1030.72 nm	0.3 nm	11.73 MHz	752 ps	260 mW	

Table S1. Nonlinear absorption coefficients of different quantum dot materials.

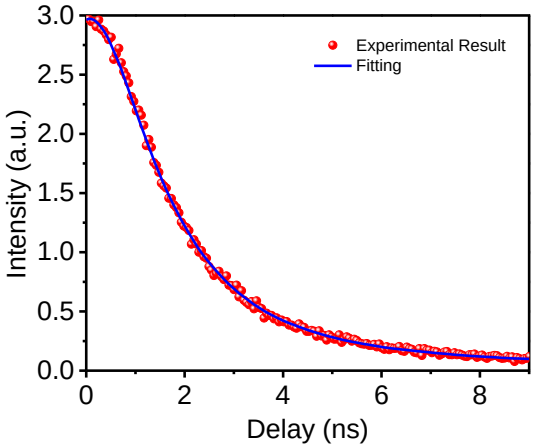

Fig. S1 The time-resolved decay spectra of GaTe quantum dots with a pump wavelength of 800 nm.

1 H. Yu, X. Zheng, K. Yin, X. A. Cheng and T. Jiang, *Appl. Opt.*, 2015, **54**, 10290–10294.

2 Y. Xu, Z. Wang, Z. Guo, H. Huang, Q. Xiao, H. Zhang and X. F. Yu, *Adv. Opt. Mater.,* 2016, **4**, 1223–1229.

3 M. Liu, X. F. Jiang, Y. R. Yan, X. De Wang, A. P. Luo, W. C. Xu and Z. C.

Luo, *Opt. Commun.,* 2018, **406**, 85–90.
4 J. Du, M. Zhang, Z. Guo, J. Chen, X. Zhu, G. Hu, P. Peng, Z. Zheng and H. Zhang, *Sci. Rep.,* 2017, **7**, 1–10.
5 A. H. A. Rosol, H. A. Rahman, E. I. Ismail, Z. Jusoh, A. A. Latiff and S. W. Harun, *Chinese Opt. Lett.*, 2017, **15**, 071405.
6 M. B. H. Mahyuddin, A. A. Latiff, M. F. M. Rusdi, N. Irawati and S. W. Harun, *Opt. Commun.,* 2017, 397, 147–152.
7 B. Liu, L. Gao, W. W. Cheng, X. S. Tang, C. Gao, Y. L. Cao, Y. J. Li and T. Zhu, *Opt. Express*, 2018, **26**, 7155–7162.
8 K. Wei, S. Fan, Q. Chen and X. Lai, *Opt. Express*, 2017, **25**, 24901–24906.
9 N. Ming, S. Tao, W. Yang, Q. Chen, R. Sun, Ch. Wang, S. Wang, B. Man and H. Zhang, *Opt. Express*, 2018, **26**, 9017–9026.
10 L. Yun, Y. Qiu, C. Yang, J. Xing, K. Yu, X. Xu and W. Wei, *Photonics Res.*, 2018, **6**, 1028–1032.
11 Y. Shi, H. Long, S. Liu, Y. H. Tsang and Q. Wen, *J. Mater. Chem. C*, 2018, **6**, 12638–12642.