## The Research Grants Council of Hong Kong NSFC/RGC Joint Research Scheme \_\_\_\_\_\_\_Joint Completion Report\_\_\_\_

(Please attach a copy of the completion report submitted to the NSFC by the Mainland researcher)

# **Part A:** The Project and Investigator(s)

### 1. Project Title

Synthesis of Anisotropic Perovskite Nanocrystals with Polarized Emission for Light Emitting Diodes

各向異性鈣鈦礦納米晶的可控製備與偏振發光應用研究

2. Investigator(s) and Academic Department/Units Involved							
	Hong Kong Team	Mainland Team					
Name of Principal	Prof. Andrey ROGACH	Prof. Haizheng ZHONG					
Investigator (with title)	-	_					
Post	Chair Professor	Professor					
Unit / Department /	Department of Materials	Beijing Institute of					
Institution	Science and Engineering,	Technology (BIT)					
	City University of Hong						
	Kong (CityU)						
Contact Information	andrey.rogach@cityu.edu.hk	hzzhong@bit.edu.cn					
Ca investigator(a)	Dr. KEDCHAW Storber	Dr. Dia alara CUEN					
Co-investigator(s)	Dr. KERSHAW Stephen	Dr. Bingkun CHEN					
(with title and	Vincent	Dr. Lei WANG					
institution)	He HUANG	Lige LIU					
	Dr. Yuan XIONG	Sheng HUANG					
	Julian SCHNEIDER	Feng ZHANG					
		Wengao LU					
	(all CityU)	(all BIT)					

## 2. Investigator(s) and Academic Department/Units Involved

### 3. **Project Duration**

	Original	Revised	Date of RGC/					
			Institution Approval					
			( must be quoted)					
Project Start date	01-Jan-2018							
Project Completion date	31-Dec-2021							
Duration (in month)	48							
Deadline for Submission of Completion Report	31-Dec-2022							

### Part B: The Completion Report

### 5. Project Objectives

- 5.1 Objectives as per original application
- 1. Develop room temperature synthetic strategies to form anisotropic perovskite nanocrystals, especially the strategies of "facet oriented growth" and "self-organization"
- 2. Study both experimentally and theoretically the growth mechanism of anisotropic perovskite nanocrystals and use the resulting models to optimize the resulting materials
- 3. Establish the strategies for the assembly of anisotropic perovskite nanocrystal into oriented thin films and optimize their polarized emission
- 4. Explore the fabrication of polarized light emitting diodes based on photoluminescence down-conversion and electroluminescence mechanisms.

# 5.2 Revised Objectives

N.A.

### 6. Research Outcome

Major findings and research outcome (maximum 1 page; please make reference to Part C where necessary)

We refer to the section 5.3 for the summary of major findings and the research outcome of this project. It was difficult for us to separate those from the "realisation of objectives"; from that reason, we decided to summarize them together under 5.3, while using app. two pages in total as a combined length of sections 5.3 and 6.

Potential for further development of the research and the proposed course of action *(maximum half a page)* 

This research will further proceed along the following lines. We will continue to translate the technique of photoalignment of II-VI semiconductor nanorods to the best and most stable perovskite nanorods samples, while focusing on achievement of the highest possible anisotropy values (>0.4). We will further improve photoluminescence quantum yields of 2D Ruddlesden-Popper perovskite films, which are potentially suitable for down-conversion LED devices. For the charge-injection electroluminescent LEDs, we will focus on development of bright and stable perovskite cuboids self-assembled from single nanoplatelets. We will need to demonstrate our ability to reliably produce them in all three basic emitting colors (green and red, apart from the already demonstrated blue ones), while achieving high photoluminescence quantum yield and high stability. Then we will apply those samples in the different color LEDs. We are now preparing an application on this topic for a next joint NSFC-RGC grant, in collaboration with the group of Prof. Jianjun Tian (BUST). We are confident that based on an extended knowledge which has been accumulated and disseminated within the present project, we will be able to further improve both the performance characteristics and, even more important, the long-term stability under operational conditions for the electroluminescent perovskite LEDs.

### 7. The Layman's Summary

(describe <u>in layman's language</u> the nature, significance and value of the research project, in no more than 200 words)

Lead halide perovskites as a class of materials have attracted a great deal of interest for light emitting devices (LEDs). These materials can be grown in solution as anisotropic elongated nanocrystals (so-called nanorods), and in this form they offer considerable advantages for applications such as color display devices. We have shown perovskites to possess very attractive optical performance: photoluminescence quantum yields reaching 100% whilst the emission spectra are narrow, which is useful for tri-color (red-green-blue) liquid crystal displays (LCDs). In these devices, perovskites could be emit light either as down converters, illuminated themselves by a blue LED from behind and generating green or red light; or as directly driven multi-color LEDs in their own right. Since the LCD part of the displays requires polarized light, an inherently polarized light emitted by the panel is highly desirable, which can be realized using anisotropic perovskite nanocrystals produced in this project. At the end, we brought all the potential advantages of anisotropic perovskite nanocrystals together in order to demonstrate two kinds of polarized emitters – one based on down-conversion of light, and the other based on direct electrical excitation, whilst simultaneously maintaining the high emission quantum yield and color purity of these light-emitting materials.

### Part C: Research Output

8. Peer-reviewed journal publication(s) arising <u>directly</u> from this research project

(Please attach a copy of each publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

	I A A COM	CD 11			TT' (1 1	0 1 1 1	A 1 1	A 1 . 1 1 1.1	
	Latest Status			Author(s) ( <b>bold</b> the authors	Title and	Submitted to RGC	Attached to this	Acknowledged the support of this	
Year of	Year of	Under	Under	belonging to the	<i>(with the volume,</i>	(indicate	report	Joint Research	Accessi the insti
publication	Acceptance	Review	Preparation	project teams	pages and other	the year	(Yes or	Scheme	reposito
	(For paper			and denote the	necessary	ending of	No)	(Yes or No)	(Yes or
	accepted		(optional)	corresponding	publishing details	the relevant		(= 00 01 1/0)	10507
	but not yet			author with an	specified)	progress			
	published)			asterisk*)	······································	report)			
2018				J. Schneider, T.	Aqueous-Based	2019	Yes	Yes	Yes
				Dudka, Y. Xiong, Z. Wang, N. Gaponik, A. L. Rogach*	Cadmium Telluride Quantum Dot/Polyurethane/ Polyhedral Oligomeric Silsesquioxane Composites for Color Enhancement in				
				W 71 X	Display Backlights. J. Phys. Chem. C 2018, 122, 13391-13398	2010	xr	17	V
2018				W. Zhang, J. Schneider, V. G. Chigrinov, H. S. Kwok, A. L. Rogach*, A. K. Srivastava*	Optically Addressable Photoaligned Semiconductor Nanorods in Thin Liquid Crystal Films for Display Applications. Adv. Opt. Mater. 2018, 1800250	2019	Yes	Yes	Yes
2018				Gupta, <b>T.</b> <b>Dudka</b> , V. V. Vashchenko, <b>A.</b>	Ligand Shell Engineering to Achieve Optimal Photoalignment of Semiconductor Quantum Rods for Liquid Crystal Displays. Adv. Funct. Mater. 2018, 1805094		Yes	Yes	Yes
2018				X. Zhang, X. Bai*, H. Wu, X. Zhang, C. Sun, Y. Zhang, W. Zhang, W. Zheng*, W. W. Yu, <b>A. L.</b> <b>Rogach</b> *	Water-Assisted Size and Shape Control of CsPbBr <sub>3</sub> Perovskite Nanocrystals. Angew. Chem. Int. Ed. 2018, 57, 3337-3342	2019	Yes	Yes	Yes

			-			-	
2018		C. Geng, S. Xu, H. Zhong, A. L. Rogach, W. Bi*	Aqueous Synthesis of Methylammonium Lead Halide Perovskite Nanocrystals. Angew. Chem. Int. Ed. 2018, 57, 9650-9654	2019	Yes	Yes	Yes
2018		Y. Li, H. Huang, Y. Xiong, S. V. Kershaw, A. L. Rogach*	Revealing the Formation Mechanism of CsPbBr <sub>3</sub> Perovskite Nanocrystals Produced via a Slowed-Down Microwave Assisted Synthesis. Angew. Chem. Int. Ed. 2018, 57, 5833-5837	2019	Yes	Yes	Yes
2019		T. Dudka, W. Zhang, J. Schneider, S. K. Gupta, M. P. Prodanov, V. V. Vashchenko, A. K. Srivastava*, A. L. Rogach*	Formulation of a Composite System of Liquid Crystals and Light-Emitting Semiconductor Quantum Rods: from Assemblies in Solution to Photoaligned Films. Adv. Mater. Technol., 2019, 1900695	2019	Yes	Yes	Yes
2019		S. K. Gupta, M. F. Prodanov, W. Zhang, V. V. Vashchenko, <b>T. Dudka, A.</b> <b>L. Rogach</b> <sup>*</sup> , A. K. Srivastava <sup>*</sup>	Inkjet-printed Aligned Quantum Rod Enhancement Films for their Application in Liquid Crystal Displays. Nanoscale 2019, 11, 20837-20846.	2019	Yes	Yes	Yes
2019		A. K. Srivastava*, W. Zhang, J. Schneider, J. E. Halpert, A. L. Rogach*	Luminescent Down-Conversi on Semiconductor Quantum Dots and Aligned Quantum Rods for Liquid Crystal Displays. Adv. Sci. 2019, 1901345	2019	Yes	Yes	Yes

2018		M. Lu, X. Zhang, X. Bai*, H. Wu, X. Shen, Y. Zhang*, W. Zhang, W. Zheng, H. Song, W. W. Yu, <b>A. L.</b> <b>Rogach</b> *	Spontaneous Silver Doping and Surface Passivation of CsPbI <sub>3</sub> Perovskite Active Layer Enable Light-Emitting Devices with an External Quantum Efficiency of 11.2%. ACS Energy Lett. 2018, 3, 1571-1577	2019	Yes	Yes	Yes
2019		F. Cao, D. Yang, Y. Shang, Z. Ning, L. Zhang, W. Zhang, W. Zheng, Y. Yan, <b>S. V.</b>	Trifluoroacetate Induced Small-Grained CsPbBr <sub>3</sub> Perovskite Films Result in Efficient and Stable Light-Emitting Devices. Nature Comm. 2019, 10, 665	2019	Yes	Yes	Yes
2019		C. Bi, S. Wang, <b>S. V. Kershaw</b> , J.	Thermally Stable Copper(II)-Dope d Cesium Lead Halide Perovskite Quantum Dots with Strong Blue Emission. J. Phys. Chem. Lett. 2019, 10, 943-952	2019	Yes	Yes	Yes
2019			Spontaneous Self-Assembly of Cesium Lead Halide Perovskite Nanoplatelets into Cuboid Crystals with High Intensity Blue Emission. Adv. Sci. 2019, 1900462	2019	Yes	Yes	Yes

2019	H X R K F	Huang, Y. Kiong, A. F. Richter, S. V. Kershaw, J. Seldmann, A. J. Rogach*	Using Polar Alcohols for the Direct Synthesis of Cesium Lead Halide Perovskite Nanorods with Anisotropic Emission. ACS Nano 2019, 13, 8237-8245	2019	Yes	Yes	Yes
2019	Y D R Ji <b>R</b>	Yu, M. Zhang, D. Chen, C. Li, R. Chen, G. ia, A. L. Rogach*, X. Yang*	Stable, Strongly Emitting Cesium Lead Bromide Perovskite Nanorods with High Optical Gain Enabled by an Intermediate Monomer Reservoir Synthetic Strategy. NanoLett. 2019, 19, 6315-6322	2019	Yes	Yes	Yes
2019	Y Y G G L	<ul> <li>Yang, J. Meng,</li> <li>Y. Wang, Y.</li> <li>G. Z. Shao*,</li> <li>G. Zhang, A.</li> <li>D. Rogach,</li> <li>IZ. Zhong*</li> </ul>	<i>In-situ</i> Fabricated Anisotropic Halide Perovskite Nanocrystals in Polyvinylalcohol Nanofibers: Shape Tuning and Polarized Emission. Nano Research 2019, 12, 1411-1416	2019	Yes	Yes	Yes
2020	Z H K	Chang, H. Huang*, S. V. Kershaw, A. Rogach*	Advances in Metal Halide Perovskite Nanocrystals: Synthetic Strategies, Growth Mechanisms, and Optoelectronic Applications. Mater. Today 2020, 32, 204-221	2022	Yes	Yes	Yes

	Г		I				
2020		S. Li, D. Lei*,		2022	Yes	Yes	Yes
		W. Ren, X.	Perovskite				
			Nanodots Enable				
		Zhu, <b>A. L.</b>	Robust				
		Rogach, M.	Two-Photon				
			Lasing in				
		KY. Jen	Aqueous				
			Environment.				
			Nature Comm.				
			2020, 11, 1192				
2020		S. Chang*, E.	Tunable Mie	2022	Yes	Yes	Yes
		V. Ushakova,	Resonances of				
			Tin-based Iodide				
		A. Cherevkov,					
		A. V.	Islandlike Films				
		Sokolova, D.	with Enhanced				
		Gets, A.	Infrared				
			Photoluminesce				
			nce. J. Phys.				
		T. Chen, <b>A. L.</b>					
		Rogach, HZ.	2020, 11,				
		Zhong	3332-3338				
2020		Y. Dou, F.	Lattice	2022	Yes	Yes	Yes
		Cao, <b>T.</b>	Distortion in				
		Dudka, Y. Li,	Mixed-Anion				
			Lead Halide				
		Zhang, Y. Gao,	Perovskite				
		X. Yang*, A.	Nanorods Leads				
		L. Rogach*	to their High				
			Fluorescence				
			Anisotropy.				
			ACS Mater.				
			Lett. 2020, 2,				
			814-820				
2020			Cd-Rich Alloyed	2022	Yes	Yes	Yes
			$CsPb_{1-x}Cd_xBr_3$				
		Zhang, S.	Perovskite				
		Kershaw, J.	Nanorods with				
		Zhang, S. Luo,					
		Y. Li, W. W.	Emission and				
		Yu, H. Song,	Fermi Levels				
		A. L.	Fabricated				
		Rogach*, L.	through Crystal				
		Zhang*, X.	Phase				
		Bai*	Engineering.				
			Adv. Sci. 2020,				
			2000930				
2020		C. Zhang, J.	Metal Halide	2022	Yes	Yes	Yes
		Chen, S.	Perovskite				
1		Wang, L.	Nanorods: Shape				
		Kong, S.	Matters. Adv.				
		Lewis, X.	Mater. 2020,				
		Yang*, <b>A. L.</b>	2002736				
		Rogach*, G.	2002130				
		Jia*					
		J10					

2021     W. Yin, M. Li, Multidontate     2022     Yes     Yes     Yes       Qian, J. Zhang, B. Enables     Bine     Enables     Yes     Yes       W. Zhang, Y.     Bright     Choler-Samrated     Bine       Zbarg, Y.     Zight-Emitting     Dodets Based on     October-Samrated       W. Zhang, S. V.     Kershaw, X.     Zight-Emitting     Dodets Based on       Z021     S. Wang, J.     Dion-Jacobson     Yes       2021     S. Wang, J.     Strongly     2022     Yes       2021     S. Wang, J.     Iaminescent     Dion-Jacobson       Ying, Y. Zhu, Microcrystals     Horowith     Horowith       Y. Li, V.     Ning, F.     Tim Bromide       Y. Li, KH.     Dichloromethan     e. Adv. Funct.       Mater. 2021     Z. Duan, G.     Proton Donors       Kershaw, A.     Dichloromethan     e. Adv. Funct.       Mater. 2021     Z. Duan, C.     Protinigin, S. Dirkon       J. Ning, B.     Time-Dimension     al       J. Ning, B.     Kaudlesdon-Pop     Somal Science, 2021.       2021     Z. Duan, C.     Protinigin, Stable 20/3D       V. Kershaw,     L. Rogach*     Modification of Timesfer       2021     Z. Duan, S.     Highly     2022       Yes     Yes </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>								
2021     Luo, Y. Li, J.     Polyethyleneini Qian, J. Zhang, N.     Bite       Kershaw, X.     Blue     Ciolr-Saurated       Zheng*, N.     Light-Emitting       Zol1     S. Wang, J.       Popovic, S.     Storgly       Burzer, A.     Diodes Based on       Burzer, A.     Dion-Jacobson       Portniagin, C.     Tin Bronide       Low, Z. Duan, Microcrystals     Microcrystals       L. Rogach*     Noloform and       B. Djurisc, A.     Dichorom and       B. Djurisc, A.     Dichorom than       Coll Z.     Zoun, C.       Zol2 I     Z. Duan, G.       Yes     Yes       Yes     Yes       Yes     Proton Tamsfer       Ning, F.     Tiree-Dimension       J. Kogach*     Foron Oriented       Yes     Yes       Yes     Yes <th>2021</th> <th></th> <th>W. Yin, M. Li,</th> <th>Multidentate</th> <th>2022</th> <th>Yes</th> <th>Yes</th> <th>Yes</th>	2021		W. Yin, M. Li,	Multidentate	2022	Yes	Yes	Yes
2021     Luo, Y. Li, J.     Polyethyleneini Qian, J. Zhang, N.     Bite       Kershaw, X.     Blue     Ciolr-Saurated       Zheng*, N.     Light-Emitting       Zol1     S. Wang, J.       Popovic, S.     Storgly       Burzer, A.     Diodes Based on       Burzer, A.     Dion-Jacobson       Portniagin, C.     Tin Bronide       Low, Z. Duan, Microcrystals     Microcrystals       L. Rogach*     Noloform and       B. Djurisc, A.     Dichorom and       B. Djurisc, A.     Dichorom than       Coll Z.     Zoun, C.       Zol2 I     Z. Duan, G.       Yes     Yes       Yes     Yes       Yes     Proton Tamsfer       Ning, F.     Tiree-Dimension       J. Kogach*     Foron Oriented       Yes     Yes       Yes     Yes <th></th> <th></th> <th>W. Dong, Z.</th> <th>Ligand</th> <th></th> <th></th> <th></th> <th></th>			W. Dong, Z.	Ligand				
2021     Qian, J. Zhang, ine Enables     Bright W. Zhang, Y. Birght Chore-Saurated Bue Light-Emitting Diversity     Bue Light-Emitting CaPBB7, Nanoplateles. ACS Energy Lett. 2021, 6, 477-484       2021     S. Wang, J. Popovic, S. Burazer, A. Portniagin, F. Liu, KH. Low, Z. Duan, Y. Li, Y. Niong, Y. Zhu, Ning, F. Huang, A. Dichorofram and B. Djurisic, D. Dichorofram and B. Djurisic, P. Proton Tansfer Dirven Timensio al Ruddesden-Pop per Phases, Small Science, 2021     Yes. Yes. Yes. Yes. Yes. Yes. Yes. Yes.								
2021     V. Zhang, Y. Zhang, Y								
Zhang, Š. V. Korshaw, X. Zhang*, W. Zheng*, A. L. Rogach*Blue Light-Emitting Diodes Based on CSPDB7s Nanoplatelets. ACS Energy Lett. 2021, 6, 477-4842022 YesYesYes2021S. Wang, J. Popovic, S. Burazer, A. Drottniagin, F. Xiong, Y. Liu, KH. Low, Z. Duan, N. Kershaw, A. B. Djurisic, A. Dichloromethan L. Rogach*2021 YesYesYes2021Z. Duan, S. Kershaw, A. Drottniagin, S. Portniagin, S. Na, S. Wang, J. Niong, Y. Zhu, Niong, Y. Zhu, S. Niong, Y. Zhu, Molecular Proton Donors Proton Donors Proton Donors Proton Donors Proton Donors Proton Donors Proton Transfer Driven Mddification of Three-Dimension al A Portniagin, S. Perovskites to Proton Sing, S. Proton								
2021     S. Wang, J. Rogach*     Simgly All Signed Strongly Popovic, S. Burazer, A. Portniagin, F. S. V. S. V. Burazer, A. Portniagin, F. Burazer, A. Dion-Jacobson     2022     Yes     Yes     Yes       2021     S. Wang, J. S. Strongly Popovic, S. Burazer, A. Portniagin, F. S. V. S. V. S. V. S. V. B. Diprisica S. V. S. S. S. S. Mall Science, 2021, 2100114     2022     Yes     Yes     Yes       2021     Z. Duan, G. V. Kershaw, A. L. Rogach* S. V. S. S. Sall Science, 2021, 2100114     2022     Yes     Yes     Yes       2021     Z. Duan, S. V. Kershaw, A. L. Rogach, S. Na S. Stall Science, 2021, 2100114     2022     Yes     Yes     Yes       2021     Z. Duan, S. V. Kershaw, A. L. Rogach, S. V. Kershaw, A. L. Rogach, S. V. Kershaw, A. L. Rogach, S. V. Kershaw, A. L. Rogach, S. V. Kershaw, A. L. Rogach, S. Sanall Science, 2021, 2100114     Yes     Yes								
2021     S. Wang, J. Rogach*     Strongly Luminescent Burracer, A. Portniagin, F. Xiong, Y. Zhu, N. Kershaw, A.     Strongly Luminescent Dion-Jacobson Portniagin, F. Nanoplatelets. ACS Energy Lett. 2021, 6, 477,444     2022     Yes     Yes       2021     S. Wang, J. Burracer, A. Portniagin, F. Xiong, Y. Zhu, N. Li, X.     Strongly Luminescent Dion-Jacobson Portniagin, F. Nin Bromide     2022     Yes     Yes       2021     S. Wang, J. Burracer, A. Portniagin, F. Xiong, Y. Zhu, S. V. Niong, Y. Zhu, S. V. Proton Donors Choroform and D. Diorload Choroform and D. Sing, F.     2022     Yes     Yes       2021     Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F.     Proton Transfer Driven     2022     Yes     Yes       2021     Z. Duan, G. Ning, F.     Provskites to Provskites to V. Kershaw, L. Zhang*, A. L. Rogach*     Poorskites to Porvelineston al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114     2022     Yes     Yes       2021     Z. Duan, S. V. Kershaw, A. L. Rogach*     2022     Yes     Yes     Yes       2021     Z. Duan, S. V. Kershaw, A. L. Rogach*     2022     Yes     Yes     Yes								
2021     S. Wang, J. Rogach*     Diodes Based on C.P.Bbr, Nanoplatelets. ACS Energy Lett. 2021, 6, 477-484     Storogly 2022     Yes     Yes       2021     S. Wang, J. Popovic, S. Burazer, A. Portniagin, Y. Li, Y. Nion, Y. Li, Y. Soro, Y. Ling, P. Soro, Y. Li, Y. Soro, Y. Li, Y. Soro, Y. Ling, P. Soro, Y. Ling, S. Soro, Y. Coro, S. Small Science, 2021.     Yes     Yes       2021     Z. Duan, S. Wang, J. Qi, A. Portniagin, S. V. Kershaw, A. L. Rogach*     Huang, A. Portniagin, S. Stall 20:30D Nither Science, 2021, 2100114     2022     Yes     Yes       2021     Z. Duan, S. Wang, J. Qi, A. Portniagin, S. V. Kershaw, A. L. Rogach*     Huang, S. V. Kershaw, A. L. Rogach*     Huang, S. V. Kershaw, A. L. Rogach*     2022     Yes     Yes								
2021     S. Wang, J. Popovic, S. Burazer, A. Portniagin, F. Lu, K. +H. Perovskie     Strongly 2022     Yes     Yes     Yes       2021     S. Wang, J. Burazer, A. Portniagin, F. Liu, K. +H. Perovskie     Strongly Luminescent Diom-Jacobson Portniagin, F. Huang, Y. Zhu, Nicocarystals Induced by Xiong, Y. Zhu, B. Djurisic, A. B. Djurisic, S. C. Potoon Transfer Bromison A. B. Doffing, S. V. Kershaw, A. L. Rogach*     2022 Yes     Yes     Yes       2021     Z. Duan, S. Wang, J. Oji A. Döring, S. V. Kershaw, A. L. Rogach*     Highly Laminescent and Bromide Perovskite Films. J. Phys. Chem. C. 2021, I25.     Yes     Yes								
2021     S. Wang, J.     Strongly 477-484     2022     Yes     Yes       2021     S. Wang, J.     Strongly Popovic, S.     Strongly Burazer, A.     2022     Yes     Yes       2021     S. Wang, J.     Strongly Popovic, S.     Strongly Dion-Jacobson Portniagin, F.     2022     Yes     Yes       2021     S. V. Duan, Nicrocrystals Induced by Xiong, Y. Zhu, S. V.     Induced by Proton Donors Chloroform and B. Djurist. A.     Dichlormethan e. Adv. Funct. Mater. 2021, 2102182     Yes     Yes       2021     Z. Duan, G.     Proton Transfer Na, S. Wang, J. Ning, B.     Proton Transfer Turce-Dimension al Hybrid     2022     Yes     Yes       2021     Z. Duan, G.     Proton Transfer Huang, A.     Proton Transfer Provskites to Proton Dirented     2022     Yes     Yes       2021     Z. Duan, S.     V. Kershaw, A.     Two-Dimension al Ruddlesden-Pop per Phases, Small Science, 2021, 2100114     2022     Yes     Yes       2021     Z. Duan, S.     Wang, J. Qi, A. Portniagin, S.     Highly Stable 2D/3DD oriented     Yes     Yes       2021     Z. Duan, S.     Kwang, I. Qi, A. Portniagin, S.     Highly Stable 2D/3DD Oriented     Yes     Yes								
2021     S. Wang, J.     Strongly Popovic, S.     Strongly Burazer, A.     2022     Yes     Yes     Yes       2021     S. Wang, J.     Strongly Popovic, S.     Strongly Dion-Jacobson     2022     Yes     Yes     Yes       2021     Yes     Yes     Yes     Yes     Yes     Yes       2021     Yes     Yes     Yes     Yes     Yes       2021     Yes     Yes     Yes     Yes       2021     Z. Duan, G.     Proton Donors     Nicoroform and Dichloromethan     Proton Transfer       2021     Z. Duan, G.     Proton Oton Transfer     Diven     Modification of Modification of Nag, F.     Yes       2021     Z. Duan, G.     Prorton Origins, S.     Form Oriented Na, S. Wang, J.     2022     Yes       2021     Z. Duan, G.     Protringin, S.     Proterom state Nag, F.     Three-Dimension Al Hybrid     2022     Yes       2021     Z. Duan, S.     Wang, J. Qi, A. Portningin, S.     Form Oriented Perovskites to V. Kershaw, A. L. Rogach*     2022     Yes     Yes       2021     Z. Duan, S.     Wang, J. Qi, A. Döring, S.     Yes     Yes     Yes       2021     Z. Duan, S.     Wang, J. Qi, A. Döring, S.     Yes     Yes     Yes       2021     Z. Duan, S.     Wang, J. Qi, A. D			Rogach*	+				
2021     S. Wang, J. Popovic, S. Burazer, A. Portniagin, F. Luw, KH. Low, Z. Duan, Y. Li, Y. Xiong, Y. Zhu, N. Kershaw, A. B. Djirisic, A. L. Rogach*     2022 Laminescent Provskite Perovskite Induced by Notecular Proton Donors Chloroform and e. Adv. Funct. Mater. 2021, 2021     Yes     Yes     Yes       2021     Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. Huang, A. Portniagin, S. V. Kershaw, A. L. Rogach*     Proton Transfer Driven Perovskite to Form Oriented Perovskites to Proton Donors Chloroform and e. Adv. Funct. Mater. 2021, 2021     Yes     Yes       2021     Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. Huang, A. Portniagin, S. V. Kershaw, A. L. Rogach*     Proton Transfer Driven Perovskites to Form Oriented Perovskites to Form Oriented Ruddlesden-Pop per Phases. Small Science, 2021, 2100114     Yes     Yes       2021     Z. Duan, S. V. Kershaw, A. D. Rogach*     Highly Luminescent and Bromide Perovskite Films. J. Phys. Chem. C. 2021, 1205     Yes     Yes								
2021     S. Wang, J.     Strongly     2022     Yes     Yes       2021     Popovic, S.     Burazer, A.     Dion-Jacobson     Yes     Yes       Portniagin, F.     Tin Bromide     Perovskite     Dion-Jacobson       Liu, KH.     Low, Z. Duan, Microcrystals     Microcrystals     Nicroarticle       N. V. Li, Y.     Nalecular     Proton Donors     Proton Donors       Kershaw, A.     Dichloroform and     Dichloromethan     Proton Transfer       2021     Z. Duan, G.     Proton String, F.     Proton Office       Ning, F.     Ning, F.     Proton Transfer     2022       2021     Z. Duan, G.     Protniagin, S.     Perovskites to       V. Kershaw,     Dirven     Modification of       Muag, A.     Portniagin, S.     Poroskites to       V. Kershaw,     L. Rogach*     Modification of       Mudlesden-Pop     Portskites to     Poroskites to       V. Kershaw,     L. Rogach*     Stable 20/3D       A. Portniagin, S.     Highly     2022       Ves     Yes     Yes       A. Döring, S.     Stable 20/3D       A. Döring, S.     Octadecylammo       A. Döring, S.     Octadecylammo       A. Döring, S.     Octadecylammo       A. Döring, S.     Num/Form				0.				
2021     S. Wang, J. Popovic, S. Burazer, A. Portniagin, F. Liu, KH. Low, Z. Duan, Y. Li, Y. Niong, Y. Zhu, Nicorcrystals Induced by Nolecular Proton Donors Kershaw, A. L. Rogach*     2022 Yes     Yes     Yes       2021     Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. Law, S. V. Souther and the state of the								
2021     Z. Duan, G. Ning, F. Huang, A. Portmiagin, F. Lu, KH. Low, Z. Duan, Microcrystals N. V. S. V.     Luminescent Dion-Jacobson Perovskite Provoskite Chloroform and B. Djurisic, A. Dichloromethan e. Adv. Funct. Mater. 2021, 2102182     2022     Yes     Yes       2021     Z. Duan, G. Ning, B. V. Kershaw, L. Zhang*, A. Dichloromethan e. Adv. Funct. Mater. 2021, 2102182     2022     Yes     Yes       2021     Z. Duan, G. Ning, B. V. Kershaw, L. Zhang*, A. L. Rogach*     Modification of Ning, F. Huang, A. Portmiagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*     Zouz     Yes     Yes       2021     Z. Duan, S. V. Kershaw, L. Zhang*, A. L. Rogach*     Highly Modification of al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114     2022     Yes     Yes       2021     Z. Duan, S. V. Kershaw, A. L. Rogach*     Highly Highly Highly Luminescent and A. Portniagin, Stable 2D/3D Octadecylammo Perovskite Films, J. Phys. Chem. C. 2021, 1205     Yes     Yes				477-484				
2021     Zourniagin, F.     Fin Bronide Portniagin, S.     Join-Jacobson Portnide       2021     Z. Duan, S.     Nolecular N. Kershaw, A.     Proton Donors Chloroform and B. Djurisic, A.     Proton Donors Chloroform and B. Djurisic, A.     2022       2021     Z. Duan, G. Na, S. Wang, D. Ning, F.     Proton Transfer Driven     2022     Yes       2021     Z. Duan, G. Na, S. Wang, D. Ning, F.     Proton Transfer Driven     2022     Yes       2021     Z. Duan, G. Na, S. Wang, D. Ning, F.     Proton Transfer Driven     2022     Yes       2021     Z. Duan, G. Na, S. Wang, D. Ning, F.     Proton Transfer Driven     2022     Yes       2021     Z. Duan, S. Wang, J. Qi, A. Dortniagin, S.     Provo-Skites to Small Science, 2021, 2100114     Yes       2021     Z. Duan, S. Wang, J. Qi, A. Portniagin, S. V. Kershaw, A. L. Rogach*     Highly Luminescent and Stable 2D/3D     Yes       2021     Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*     Highly Luminescent and Bromide Perovskite     Yes       2021     Z. Duan, S. Wang, J. Qi, A. Döring, S.     Highly Cidadeylammo nium/Formamidi nium/Formamidi Perovskite     Yes	2021		S. Wang, J.	Strongly	2022	Yes	Yes	Yes
2021Z. Duan, G. Ning, P. Xing, Y. Zhu, Nicrocrystals N. L. Rogach*2022 Proton Donors Chloroform and B. Djurisic, A. Dichloromethan e. Adv. Funct. Mater. 2021, 21021822022 YesYesYes2021Z. Duan, G. Na, S. Wang, V. Kershaw, A. L. Rogach*Dichloromethan Porton Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 21001142022 YesYesYes2021Z. Duan, S. V. Kershaw, A. L. Rogach*Dichloromethan Porton Transfer Porton Transfer Portoningin, S. Porton Transfer Portoningin, S. Portoningin, S. Portingin, S.<			Popovic, S.	Luminescent				
2021Z. Duan, G. Ning, P. Xing, Y. Zhu, Nicrocrystals N. L. Rogach*2022 Proton Donors Chloroform and B. Djurisic, A. Dichloromethan e. Adv. Funct. Mater. 2021, 21021822022 YesYesYes2021Z. Duan, G. Na, S. Wang, V. Kershaw, A. L. Rogach*Dichloromethan Porton Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 21001142022 YesYesYes2021Z. Duan, S. V. Kershaw, A. L. Rogach*Dichloromethan Porton Transfer Porton Transfer Portoningin, S. Porton Transfer Portoningin, S. Portoningin, S. Portingin, S.<				Dion-Jacobson				
Liu, KH. Low, Z. Duan, Y. Li, Y. Xiong, Y. Zhu, S. V.       Perovskite Microcrystals Induced by Nolecular       Nalexity Microcrystals Microcrystals Molecular         2021       Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. Na, S. Wang, J. Driven Modification of Three-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Portniagin, S. V. Kershaw, L. Rogach*       2022       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, L. Rogach*       2022       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, L. Rogach*       2022       Yes       Yes         2021       Z. Duan, S. V. Kershaw, L. Rogach*       Iuminescent and Stable 2D/3D octatecylammo nium/Formamidi nium Lead Bromide Perovskite Films, J. Phys. Chem. C. 2021, 125,       Yes       Yes								
2021Z. Duan, Y. Li, Y. Xiong, Y. Zhu, Nolecular B. Djurisic, A. 1. Rogach*Microcrystals Induced by Proton Donors Chloroform and Dichloromenthan e. Adv. Funct. Mater. 2021, 2102182VesYes2021Z. Duan, G. Na. S. Wang, J. Ning, B. Xing, F. Huang, A. Portniagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*Proton Transfer Proton Transfer Three-Dimensio nal Hybrid Portwildesden-Pop per Phases. Small Science, 2021YesYes2021Z. Duan, G. Na. S. Wang, J. Ning, F. Huang, A. Portniagin, S. V. Kershaw, A. L. Rogach*Proton Transfer Three-Dimension al Hybrid Porvisites to Por Portseted L. Robel Science, 2021, 2100114YesYes2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*Highly Highly Luminescent and A. Dortniagin, Stable 2D/3D Octadecylammo nium/Formamidi Perovskite Films. J. Phys. Chem. C. 2021, 125,YesYes								
2021       Z. Duan, G.       Proton Donors         2021       Z. Duan, G.       Proton Transfer         2021       Z. Duan, S.       Portinizgin, S.         Portinizgin, S.       Promo Oriented         L. Zhang*.A.       Iwo-Dimension         Ruddlesden-Pop       Por Phases.         Small Science,       2021         Z. Duan, S.       Highly         A. Portnizgin, S.       Stable 2D/3D         A. Döring, S.       V. Kershaw,         V. Kershaw,       Luminescent and         A. Döring, S.       Stable 2D/3D         V. Kershaw,       Nording, Stable 2D/3D								
2021Z. Duan, G. Na, S. Wang, J. Ning, B. Kershaw, A. L. Rogach*Proton Transfer Proton Transfer Diriven All State 20212022YesYesYes2021Z. Duan, G. Na, S. Wang, J. Ning, B. King, F. Huang, A. L. Zhang*, A. L. Rogach*Proton Transfer Three-Dimension al Rudlesden-Pop per Phases. Small Science, 2021, 2022YesYesYes2021Z. Duan, G. Na, S. Wang, J. Ning, B. King, F. Huang, A. L. Zhang*, A. L. Rogach*Proton Transfer Three-Dimension al Rudlesden-Pop per Phases. Small Science, 2021, 21001142022YesYes2021Z. Duan, S. Wang, J. Qi, A. Döring, S. Octadecylammo nium/Formamidi R. Dortmagin, Stable 2D/20, 2021, 21001142022YesYes2021Z. Duan, S. Wang, J. Qi, A. Döring, S. Octadecylammo nium/Formamidi Perovskite Films. J. Phys. Chem. C. 2021, 125,YesYesYes								
2021       S. V. Kershaw, A. B. Djurisic, A. L. Rogach*       Proton Donors Chloroform and Dichloromethan e. Adv. Funct. Mater. 2021, 2102182       Yes       Yes         2021       Z. Duan, G. Na, S. Wang, J. Ning, B. Huang, A. Portniagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*       Proton Donors Chloroform and e. Adv. Funct. Mater. 2021, 2102182       Yes       Yes         2021       Z. Duan, G. Ning, F. Huang, A. Portniagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*       Proton Donors Chloroform and Portiven Modification of Twee-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Portniagin, S. V. Kershaw, A. L. Rogach*       Highly Luminescent and Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,       Yes       Yes								
2021Kershaw, A. B. Djurisic, A. L. Rogach*Chloroform and Dichloromethan e. Adv. Funct. 2102182See See See See See See See See See See								
B. Djurisic, A. L. Rogach*       Dichloromethan e. Adv. Funct. Mater. 2021, 2102182         2021       Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. Three-Dimensio nal Hybrid       Proton Transfer Driven Modification of Transfor nal Hybrid       2022       Yes       Yes       Yes         2021       Z. Duan, G. Ning, B. Xing, F. Three-Dimensio nal Hybrid       Portniagin, S. Vershaw, L. Zhang*, A. L. Rogach*       Perovskites to Form Oriented all Science, 2021, 2100114       Yes       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Dorining, S. V. Kershaw, A. Dorining, S. V. Kershaw, A. L. Rogach*       Perovskites to Form Oriented all Science, 2021, 2100114       Yes       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*       Highly       2022       Yes       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*       Cadecylammo nium/Formamidi num Lead Bromide Perovskite       Perovskite       Portniagin, Sible 2D/3D       Yes       Yes								
2021       Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. L. Rogach*       e. Adv. Funct. Mater. 2021, 2102182       Yes       Yes         2021       Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. Huang, A. L. Rogach*       Driven Modification of Xing, F. Huang, A. L. Rogach*       Driven Modification of Three-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114       Yes       Yes         2021       Z. Duan, S. V. Kershaw, A. Doring, S. V. Kershaw, A. Döring, S. V. Kershaw, A. L. Rogach*       Highly Luminescent and N. Döring, S. V. Kershaw, A. L. Rogach*       2022       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*       Highly Luminescent and nium/Fornamidi nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,       Yes       Yes								
2021     Z. Duan, G. Na, S. Wang, J. Ning, B. Xing, F. Huang, A. Portniagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*     Proton Transfer Modification of Three-Dimension al Hybrid Pervskites to Form Oriented Two-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114     Yes     Yes     Yes       2021     Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*     Highly Stable 2D/3D Octadecylammo nium/Formamidi Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,     2022     Yes     Yes     Yes								
2021Z. Duan, G. Na, S. Wang, J. Ning, F.Proton Transfer Driven Modification of Xing, F. Huang, A. Portniagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*2022YesYesYes2021Z. Duan, G. Na, S. Wang, Portniagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*Modification of Noroiented Ruddlesden-Pop per Phases. Small Science, 2021, 2100114YesYesYes2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, num/Formamidi A. L. Rogach*Highly Luminescent and Num/Formamidi A. L. Rogach*2022YesYes2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, nium/Formamidi A. L. Rogach*Highly Luminescent and Num/Formamidi Hinu Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,YesYes			L. Kogacn*					
2021       Z. Duan, G. Na, S. Wang, J. Ning, B. Ning, F. Huang, A. Portniagin, S. V. Kershaw, L. Zhang*, A. L. Rogach*       Proton Transfer Driven Modification of Ning, F. nal Hybrid Perovskites to Form Oriented Two-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114       Yes       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, L. Rogach*       Perovskites to Form Oriented Ruddlesden-Pop per Phases. Small Science, 2021, 2100114       2022       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*       Highly Highly Cuadecylammo nium/Formamidi Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,       Yes       Yes       Yes								
2021Xing, S. Na, S. Wang, J. Ning, B. Xing, F. Portniagin, S. Perovskites to Form Oriented L. Zhang*, A. L. Rogach*Driven Modification of Nodification of Perovskites to Form Oriented Two-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 21001142022 YesYesYes2021Z. Duan, S. Wang, J. Qi, A. Portniagin, S. V. Kershaw, A. Dorbing, S. V. Kershaw, A. L. Rogach*Highly Luminescent and A. Portniagin, State Octade 2D/3D Notade 2D/3D Notade 2D/3D2022 YesYesYes2021Z. Duan, S. Wang, J. Qi, A. Dörning, S. V. Kershaw, A. L. Rogach*Highly Luminescent and A. Dorbing, S. Octade 2D/3D Notade 2D/3D2022 YesYesYes								
J. Ning, B.       Modification of         Xing, F.       Three-Dimensio         Huang, A.       Portniagin, S.         Portniagin, S.       Perovskites to         V. Kershaw,       L. Zhang*, A.         L. Zhang*, A.       Form Oriented         L. Rogach*       Ruddlesden-Pop         per Phases.       Small Science,         2021       Z. Duan, S.         Wang, J. Qi,       Highly         A. Portniagin,       Stable 2D/3D         Octadecylammo       nium/Formamidi         nium/Formamidi       nium Lead         Bromide       Perovskite         Films. J. Phys.       Chem. C. 2021, 125, 125, 125, 125, 125, 125, 125, 1	2021				2022	Yes	Yes	Yes
Zing, F.       Three-Dimensio nal Hybrid         Portniagin, S.       Perovskites to V. Kershaw, L. Zhang*, A.       Perovskites to Form Oriented Two-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114       Ves         2021       Z. Duan, S.       Highly Name, J. Qi, A. Portniagin, Stable 2D/3D       2022       Yes         2021       Z. Duan, S.       Highly Name, J. Qi, A. Portniagin, Stable 2D/3D       2022       Yes         Noring, S.       V. Kershaw, A. L. Rogach*       Octadecylammo nium/Formamidi nium Lead Bromide Perovskite       Yes								
2021       Z. Duan, S.       Highly       2022       Yes       Yes         Yes       Wang, J. Qi,       Luminescent and       A. Portniagin,       Stable 2D/3D       Octadecylammo         A. Döring, S.       Octadecylammo       nium Lead       Bromide       Perovskite       Films. J. Phys.         Films. J. Phys.       Chem. C. 2021, 125,       125,       Yes       Yes       Yes								
2021       Z. Duan, S. Wang, J. Qi, A. Doriniagin, S. L. Rogach*       Perovskites to Form Oriented Two-Dimension al Ruddlesden-Pop per Phases. 2021, 2100114       2022       Yes       Yes         2021       Z. Duan, S. Wang, J. Qi, A. Portniagin, A. Döring, S. V. Kershaw, A. L. Rogach*       Highly Luminescent and Stable 2D/3D       2022       Yes       Yes       Yes         Perovskite Films. J. Phys. Chem. C. 2021, 125,       Juny S. V. Kershaw, Stable 2D/3D       Juny S. V. Kershaw, Stable 2D/3D       Juny S. V. Kershaw, Stable 2D/3D       Juny S. V. Kershaw, Stable 2D/3D       Yes       Yes			Xing, <b>F.</b>	Three-Dimensio				
V. Kershaw, L. Zhang*, A. L. Rogach*Form Oriented Two-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114Form Oriented Two-Dimension al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114Yes2021Z. Duan, S. Wang, J. Qi, A. Portniagin, A. Döring, S. V. Kershaw, A. L. Rogach*Highly Stable 2D/3D Octadecylammo nium/Formamidi nium Lead Browskite Films. J. Phys. Chem. C. 2021, 125,Yes			Huang, A.	nal Hybrid				
2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*Highly Luminescent and Stable 2D/3D2022 YesYesYes2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*Highly Luminescent and Stable 2D/3D2022 YesYesYes			Portniagin, S.	Perovskites to				
2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*Highly Luminescent and Stable 2D/3D Octadecylammo nium/Formamidi nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,2022 YesYesYes			V. Kershaw,	Form Oriented				
2021L. Rogach*al Ruddlesden-Pop per Phases. Small Science, 2021, 2100114NewNewNew2021Z. Duan, S.Highly2022YesYesYes2021Z. Duan, S.Highly2022YesYesYesNang, J. Qi, A. Portniagin, A. Döring, S.Stable 2D/3DNewNewNewNewN. Kershaw, nium/Formamidi Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,NewNewNewNew			L. Zhang*, A.	Two-Dimension				
2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*Highly Luminescent and Nium/Formamidi nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,YesYesYes				al				
2021Z. Duan, S. Wang, J. Qi, A. Döring, S. V. Kershaw, A. L. Rogach*Per Phases. Small Science, 2021, 21001142022 YesYesYes2021Z. Duan, S. Wang, J. Qi, A. Döring, S. Octadecylammo nium/Formanidi nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,YesYesYes			8					
Small Science, 2021, 2100114Small Science, 2021, 2100114Small Science, 2021, 2100114Small Science, 2021, 2100114Small Science, 2021YesYes2021Z. Duan, S. Wang, J. Qi, A. Portniagin, A. Döring, S. V. Kershaw, A. L. Rogach*Highly Luminescent and Stable 2D/3D2022YesYesYesOctadecylammo nium/Formamidi nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,TesYesYes								
2021Z. Duan, S. Wang, J. Qi, A. Portniagin, A. Döring, S. V. Kershaw, nium/Formamidi nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,YesYes								
2021Z. Duan, S. Wang, J. Qi, A. Portniagin, M. Döring, S. V. Kershaw, A. L. Rogach*Highly Luminescent and Stable 2D/3D Octadecylammo nium/Formamidi nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,YesYesYes								
Wang, J. Qi, Luminescent and A. Portniagin, Stable 2D/3D A. Döring, S. V. Kershaw, A. L. Rogach* Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,	2021		7 Duan S		2022	Yes	Ves	Yes
A. Portniagin,       Stable 2D/3D         A. Döring, S.       Octadecylammo         N. Kershaw,       nium/Formamidi         nium Lead       Bromide         Perovskite       Films. J. Phys.         Chem. C. 2021,       125,	2021					105	100	103
A. Döring, S.       Octadecylammo         N. Kershaw,       nium/Formamidi         nium/Formamidi       nium Lead         Bromide       Perovskite         Films. J. Phys.       Chem. C. 2021,         125,       125,								
V. Kershaw, A. L. Rogach* Perovskite Films. J. Phys. Chem. C. 2021, 125,								
A. L. Rogach* nium Lead Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,								
Bromide Perovskite Films. J. Phys. Chem. C. 2021, 125,								
Perovskite Films. J. Phys. Chem. C. 2021, 125,			A. L. Kogach*					
Films. J. Phys. Chem. C. 2021, 125,								
Chem. C. 2021, 125,								
125,				•				
17501-17508								
				17501-17508				

**9.** Recognized international conference(s) in which paper(s) related to this research project was/were delivered (*Please attach a copy of each delivered paper. All listed papers must acknowledge RGC's funding support by quoting the specific grant reference.*)

Month/Year/ Place	Title		this report (Yes or No)		Accessib the instit repositor (Yes or N
		relevant progress report)		(Yes or No)	(105 07 1

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May 2018, Hangzhou, China	Light-Emitting Colloidal Nanostructures	International Symposium on Advanced Nanomaterials	2019	No	Yes	No
June 2018, Hong Kong	Light Emission from Perovskite Nanocrystals and Their Application in Optoelectronic Devices	Gordon Research Conference on Hybrid Electronic and Photonic Materials and Phenomena	2019	No	Yes	No
June 2018, Hong Kong	Light Emission from Perovskite Nanocrystals and Their Application in Optoelectronic Devices	The 14 <sup>th</sup> International Conference on Nanostructured Materials	2019	No	Yes	No
August 2018, Dresden, Germany	Synthesis of Light Emitting Perovskite Nanocrystals and Their Application in Optoelectronic Devices	International Workshop on Single Nanostructures, Nanomaterials, Aerogels and Their Interactions	2019	No	Yes	No
Sept. 2019, Warsaw, Poland	Synthesis of Light Emitting Perovskite Nanocrystals and Their Application in Optoelectronic Devices	E-MRS Fall Meeting	2019	No	Yes	No
May 2019, XiAn, China	Light-Emitting Perovskite Nanocrystals	2019 Xi'An Symposium on Materials Chemistry	2019	No	Yes	No
May 2019, Hong Kong	Shape and Morphology Control of Perovskite Nanocrystals	ACS Materials Letters Summit	2019	No	Yes	No
June 2019, Singapore	Light Harvesting and Emission with Perovskite Nanocrystals	10th International Conference on Materials for Advanced Technologies (ICMAT 2019)	2019	No	Yes	No
July 2019, Moscow, Russia	Perovskite Nanocrystals in Light-Emitting Devices	20th International Conference on Physics of Light-Matter Coupling in Nanostructures	2019	No	Yes	No
August 2019, Chengdu, China	Light-Emitting Perovskite Nanocrystals and their Application in Optoelectronic Devices	2019 International Symposium on Perovskites for Optoelectronic Applications and Beyond	2019	No	Yes	No
August 2019, Beijing, China	Light-Emitting Perovskite Nanocrystals and their Application in Optoelectronic Devices	ChinaNANO2019	2019	No	Yes	No
June 2020, Online	Perovskite Nanocrystals in Light-Emitting Devices	NanoGE Online Meetup Conference "Perovskite Quantum Dots: Syntheses, Physical Properties and Applications to Optoelectronic Devices"	2022	No	Yes	No
July 2020, Online	Light-Emitting Devices with Perovskite Nanocrystals	NanoGE Online Meetup Conference "Internet Conference for Quantum Dots (iCQD)"	2022	No	Yes	No
Novem. 2020, Singapore Online	Perovskite Nanocrystals in Light-Emitting Devices and Beyond	9 <sup>th</sup> MRS-S National Conference on Advanced Materials	2022	No	Yes	No

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December	Hybrid Perovskite Based	NanoGE International	2022	No	Yes	No
2020, Online	Nanomaterials for Photovoltaics and Optoelectronics	Online Conference "Hybrid Materials and Optoelectronic Devices" (HYBRIDOE)				
January 2021, Hong Kong Online	Synthesis and Polarized Emission of Perovskite Nanorods	Workshop on Advanced Display Materials	2022	No	Yes	No
June 2021, Online	Perovskite Nanocrystals in Light-Emitting Devices	SmartMat (Wiley) Webinar	2022	No	Yes	No
September 2021, Porto, Portugal, Online	Synthesis and Spectroscopy of Perovskite Nanocrystals	International Meet & Expo on Nanotechnology (NANOMEET2021)	2022	No	Yes	No
October 2021, Online	Perovskite Nanocrystals in Light-Emitting Devices	NanoGE Online Fall Meeting 2021	2022	No	Yes	No
Novem. 2021, Hanoi, Vietnam, Online	Perovskite Nanocrystals in Light-Emitting Devices	10th International Workshop on Advanced Materials Science and Nanotechnology (IWAMSN 2021)	2022	No	Yes	No
December 2021, Nur-Sultan, Kazachstan, Online	Perovskite Nanocrystals in Light-Emitting Devices	International Symposium on Emerging Materials and Devices	2022	No	Yes	No

### **10. Student(s) trained** (*Please attach a copy of the title page of the thesis.*)

Name	Degree registered for	$\mathcal{C}$	Date of thesis submission/ graduation
Tetiana DUDKA	PhD		31/08/2019
Yanxiu LI	PhD	01/09/2017	27/08/2020
Zonghui DUAN	PhD	01/09/2018	25/08/2021

- **11. Other impact** (e.g. award of patents or prizes, collaboration with other research *institutions, technology transfer, etc.*)
- Related to the research conducted for this project, the Hong Kong PI Prof. Rogach has been awarded the Croucher Foundation Senior Research Fellowship in 2018.

Collaborations have been established with the groups of:

- Prof. Jianjun Tian, University of Science and Technology Beijing, China
- Prof. Xuyong Yang, Shanghai University, China

**12. Statistics on Research Outputs** (*Please ensure the summary statistics below are consistent with the information presented in other parts of this report.*)

	Peer-reviewed	Conference	Scholarly books,	Patents awarded	Other research
	journal	papers	monographs and		outputs
	publications		chapters		(Please specify)
No. of outputs	26	21	0	0	0
arising directly					
from this research					
project [or					
conference]					