Supporting Information

Platinum complexes with aggregation-induced emission

Sheng-Yi Yang†[a], Yingying Chen†[a], Ryan T. K. KWOK [a]*, Jacky W. Y. LAM [a]*, Ben Zhong Tang [a,b]*

[a] Department of Chemistry, Hong Kong Branch of Chinese National Engineering Research Center for Tissue Restoration and Reconstruction, Division of Life Science, State Key Laboratory of Molecular Neuroscience, and Department of Chemical and Biological Engineering, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong 999077, China.

[b] School of Science and Engineering, Shenzhen Institute of Aggregate Science and Technology, The Chinese University of Hong Kong, Shenzhen (CUHK-Shenzhen), Guangdong 518172, China.

†These authors contributed equally to this work.

E-mail: chryan@ust.hk; chjacky@ust.hk; tangbenz@cuhk.edu.cn.

Table S1. Relevant information on reported cyclometallic platinum complexes, including complex types, AIE mechanisms, application fields, aggregation environments, aggregation states, and corresponding references.

Year	Type of ligands	AIE mechanism	Applications	Aggregation environment	Aggregation state	Ref.
2002	Tridentate ligand	Pt-Pt interactions	Sensor	Acetonitrile/diethyl ether	Nanoparticles	[1]
2005	Tridentate ligand	Pt-Pt interactions	Sensor	Acetonitrile/diethyl ether	Nanoparticles	[2]
2005	Tridentate ligand	Pt-Pt interactions	Sensor	Poly(acrylic acid)/TBAH	Nanoparticles	[3]
2006	Polynuclear	Pt-Pt interactions	Sensor	DMSO	Nanoparticles	[4]
2007	Tridentate ligand	Pt-Pt interactions	Sensor	DMSO	Gels	[5]
2008	Polynuclear	RIM	/	Acetonitrile/H_2O	Nanoparticles	[6]
2009	Tridentate ligand	Pt-Pt interactions	Sensor	Polyacetylene in methanol	Nanoparticles	[7]
2009	Tridentate ligand	Pt-Pt interactions	Optoelectronic	Methanol/H_2O	Microfibers	[8]
2009	Tridentate ligand	Pt-Pt interactions	Sensor	G-quadruplex formation upon K^+ ion binding	Nanoparticles	[9]
2011	Tridentate ligand	Pt-Pt interactions	Sensor	Buffer–CH_3CN solution /α-glucosidase	Nanoparticles	[10]
2011	Polynuclear	Pt-Pt interactions	Sensor	H_2O	Nanoparticles	[11]
2011	Polynuclear	RIM	Stimuli response	Cyclohexane and sonication	Gels	[12]
2011	One ligand	RIM	Optoelectronic	Crystalline	Crystals	[13]
2010	Polynuclear	RIM	/	Acetonitrile/dichloromethane	Nanoparticles	[14]
2011	Tridentate ligand	Pt-Pt interactions	Sensor	Acetone/H_2O	Nanoparticles	[15]
2011	Tridentate ligand	Pt-Pt interactions	Optoelectronic	Frozen matrices /thin film	Fibers or gels	[16]
2010	Three ligands	Other mechanisms	/	Solid state	Solids	[17]
2012	Heteroleptic bidentate ligand	RDES	Biological	THF/H_2O	Nanoparticles	[18]

Table S1. Continued.

Year	Type of ligands	AIE mechanism	Applications	Aggregation environment	Aggregation state	Ref.
2013	Tridentate ligand	Pt-Pt interactions	Biological	H_2O	Nanoparticles	[19]
2013	Heteroleptic bidentate ligand	RIM	/	Crystalline	Crystals	[20]
2013	Tridentate ligand	Pt-Pt interactions	Biological	Tris–HCl with ATP	Nanoparticles	[21]
2013	Polynuclear	Pt-Pt interactions	/	Acetonitrile/H_2O	Nanoparticles	[22]
2014	Tridentate ligand	Pt-Pt interactions	Sensor	In aqueous buffer solutions	Nanoparticles	[23]
2014	Tridentate ligand	RIM	Sensor	Methanol/H_2O	Micelles	[24]
2014	Tridentate ligand	RIM	/	Methanol/H_2O	Nanoparticles	[25]
2014	Three ligands	RIM	Optoelectronic	THF/H_2O	Nanoparticles	[26]
2014	Heteroleptic bidentate ligand	RIM	Biological	Dichloromethane/hexane	Nanoparticles	[27]
2014	Six ligands	RIM	Biological	DMSO/PBS	Nanoparticles	[28]
2014	Six ligands	RIM	Biological	TPS-CH_2N_3/ DMSO/PIPES	Nanoparticles	[29]
2015	Tridentate ligand	Pt-Pt interactions	/	Toluene	Nanoparticles	[30]
2015	Six ligands	RIM	Biological	Incubated with GSH (100 mM)	Nanoparticles	[31]
2015	Tridentate ligand	Pt-Pt interactions	/	1,4-Dioxane/H_2O	Nanoparticles	[32]
2016	Polynuclear	Other mechanisms	/	Benzene	Gels	[33]
2016	Three ligands	RIM	Stimuli response	Methanol/H_2O	Nanoparticles	[34]
2017	Tridentate ligand	Pt-Pt interactions	Optoelectronic	Dichloromethane/ H_2O	Nanoparticles	[35]
2017	Tridentate ligand	Pt-Pt interactions	/	Acetonitrile/H_2O	Nanoparticles	[36]
2017	Tridentate ligand	Pt-Pt interactions	Sensor	Hexa-arginine in PBS buffer	Nanoparticles	[37]
2017	Three ligands	RIM	Optoelectronic	Acetonitrile/H_2O	Nanoparticles	[38]
2018	Heteroleptic bidentate ligand	Pt-Pt interactions	/	THF/acetonitrile	Nanoparticles	[39]

Table S1. Continued.

Year	Type of ligands	AIE mechanism	Applications	Aggregation environment	Aggregation state	Ref.
2018	Polynuclear	Pt-Pt interactions	/	DMSO/H_2O	Nanoparticles	[40]
2018	Tridentate ligand	Pt-Pt interactions	/	THF	Nanoparticles	[41]
2018	Tridentate ligand	RIM	/	Alcohols and dodecane	Gels	[42]
2018	Heteroleptic bidentate ligand	RIM	Biological	Dichloromethane/hexane	Nanoparticles	[43]
2018	One ligand	RIM	Optoelectronic	THF/H_2O	Nanoparticles	[44]
2018	Tridentate ligand	Pt-Pt interactions	Biological	Acetonitrile/H_2O	Nanoparticles	[45]
2018	Three ligands	RIM	Optoelectronic	THF/H_2O	Nanoparticles	[46
2019	Three ligands	Pt-Pt interactions	Sensor	Chloroform/hexane	Gels	[47]
2019	Heteroleptic bidentate ligand	Pt-Pt interactions	Stimuli response	Dichloromethane	Metallomesogens	[48]
2019	Polynuclear	RIM	/	Crystalline	Crystals	[49]
2019	Tridentate ligand	Pt-Pt interactions	Sensor	PBS buffer	Nanoparticles	[50]
2019	One ligand	Other mechanisms	/	Chloroform	Solution	[51]
2019	Heteroleptic bidentate ligand	RDES	Biological	THF/H_2O	Nanoparticles	[52]
2019	Polynuclear	RIM	/	Crystalline	Crystals	[53]
2019	Polynuclear	RIM	/	Solid state	Solids	[54]
2019	Tridentate ligand	RIM	/	DMF/H_2O	Nanoparticles	[55]
2019	Homoleptic bidentate ligand	Pt-Pt interactions	Sensor	Dichloromethane/Hg^{2+}	Liquid crystalline mesophases	[56]
2020	Four ligands	RIM	Biological	DMSO/H_2O	Nanoparticles	[57]
2020	Tridentate ligand	Pt-Pt interactions	Sensor	Solid state	Liquid crystals	[58]
2019	Tridentate ligand	RIM	/	THF/H_2O	Micelles	[59]
2020	Heteroleptic bidentate ligand	RIM	Optoelectronic	THF/H_2O	Nanoparticles	[60]
2020	Three ligands	RIM	Stimuli response	THF/H_2O	Nanoparticles	[61]
2020	Four ligands	Other mechanisms	/	Solid state	Solids	[62]

Table S1. Continued.

Year	Type of ligands	AIE mechanism	Applications	Aggregation environment	Aggregation state	Ref.
2020	Polynuclear	RIM	Optoelectronic	Crystal or neat film	Crystal or solid state	[63]
2020	Heteroleptic bidentate ligand	Other mechanisms	/	Liquid crystal	Liquid crystal	[64]
2020	Three ligands	RCSD	Optoelectronic	THF/H_2O	Nanoparticles	[65]
2020	Tridentate ligand	RIM	Stimuli response	THF/H_2O	Nanoparticles	[66]
2021	Polynuclear	Other mechanisms	Optoelectronic	THF/H_2O	Nanoparticles	[67]
2021	Homoleptic bidentate ligand	Pt-Pt interactions	Biological	THF/H_2O	Metallomesogens	[68]
2021	Polynuclear	Pt-Pt interactions	Biological	ct-DNA in Tris-HCl buffer	Nanoparticles	[69]
2021	Heteroleptic bidentate ligand	RIM	Sensor	Acetonitrile/H_2O	Nanoparticles	[70]
2021	Polynuclear	Other mechanisms	Optoelectronic	Acetonitrile/H_2O	Nanoparticles	[71]
2021	One ligand	Other mechanisms	/	Crystalline	Crystals	[72]
2021	Tridentate ligand	Pt-Pt interactions	Biological	RNA in PBS buffer	Nanoparticles	[73]
2021	Three ligands	RIM	Biological	THF/H_2O	Nanoparticles	[74]
2021	Heteroleptic bidentate ligand	RIM	/	Dichloromethane/hexane	Nanoparticles	[75]
2021	Polynuclear	Other mechanisms	Optoelectronic	Powder	Powders	[76]
2021	Three ligands	Restrained D_{2d} deformation	Optoelectronic	THF/H_2O	Nanoparticles	[77]
2022	Heteroleptic bidentate ligand	RIM	Sensor	Acetonitrile/H_2O	Nanoparticles	[78]
2022	Polynuclear	Other mechanisms	Optoelectronic	Solid state	Powders	[79]
2022	Three ligands	RCSD	Optoelectronic	THF/H_2O	Nanoparticles	[80]
2022	Tridentate ligand	RIM	Stimuli response	THF/H_2O	Nanoparticles	[81]
2022	Tridentate ligand	Pt-Pt interactions	/	Chloroform	Solutions	[82]

Table S1. Continued.

Year	Type of ligands	AIE mechanism	Applications	Aggregation environment	Aggregation state	Ref.
2022	Tridentate ligand	Pt-Pt interactions	Biological	Acetonitrile/H_2O	Nanoparticles	[83]
2022	Tridentate ligand	RIM	Biological	Ethanol/H_2O	Nanoparticles	[84]
2022	One ligand	RIM	/	DMSO/H_2O	Nanoparticles	[85]
2022	Three ligands	Restrained D_{2d} deformation	Sensor	THF/H_2O	Nanoparticles	[86]
2023	Heteroleptic bidentate ligand	RIM	/	Acetonitrile/H_2O	Nanoparticles	[87]
2023	Tridentate ligand	Pt-Pt interactions	/	Dichloromethane/toluene	Nanoparticles	[88]
2023	Polynuclear	RIM	Optoelectronic	Solid state	Solids	[89]
2023	Heteroleptic bidentate ligand	RIM	Optoelectronic	THF/H_2O	Nanoparticles	[90]
2023	Polynuclear	Pt-Pt interactions	Biological	NaCl or KCl solution	Nanoparticles	[91]
2023	Tridentate ligand	RIM	/	Acetonitrile/H_2O	Nanoparticles	[92]
2023	Heteroleptic bidentate ligand	RIM	Sensor	Acetonitrile/H_2O	Nanoparticles	[93]
2023	Homoleptic bidentate ligand	RMCT	Optoelectronic/ Biological	DMSO/H_2O	Nanoparticles	[94]

Table S2. Comparison table of three AIE mechanisms of the platinum complexes.

AIE mechanism	Type of ligands	Solution state	Aggregation state
Restriction of coordination skeletal deformation	Three ligands	(1) Monodentate ligands to rotate freely around the single bonds. (2) The S_0/S_1 minimal energy conical intersection (MECI) could be easily reached upon photoexcitation since there was almost no barrier to overcome the decay from the Frank–Condon point to MECI. (3) Coordination skeletal deformation.	(1) The coordination skeletal deformation would be greatly restricted to increase the energy gap of MECI between S_1 and S_0 and decrease the rate of IC. (2) The planar geometry of T_1 minimum was very similar to that of S_0 and similar to that of S_1 at the Frank–Condon point, which would benefit the ISC from S_1 to T_1 to promote the emission from the T_1 state.
Restrained D_{2d} deformation of the coordinating skeleton	Three ligands	(1) Monodentate ligands to rotate freely around the single bonds. (2) The S_0/S_1 minimal MECI could be easily reached upon photoexcitation since there was almost no barrier to overcome the decay from the Frank–Condon point to MECI. (3) The square-planar (D_{4h}) coordinating skeleton of Pt(II) complexes with mono-dental ligands can undergo deformation to form a tetrahedron (T_d) skeleton in their excited states to induce nonradiative decay processes and quench the emission signal in dilute solution.	The deformation of the square-planar (D_{4h}) coordinating skeleton of the Pt(II) center to tetrahedron (T_d) can be effectively restrained to facilitate radiative decay of the excited states.
Restriction of molecular configuration transformation	Homoleptic bidentate ligands	(1) The monomeric molecules undergo substantial molecular configuration transformation in S_1 and T_1 states from the square-planar one to the tetrahedral one caused by the significant metal center d−d transitions. (2) The effortless reaching of the S_0/S_1 MECI points from the Franck−Condon points, leading to the nonradiative transitions of S_1 and T_1 states.	The intermolecular interactions and the molecular packings, the molecular configuration transformation in excited states at the solid or crystal states can be efficiently restrained, obtaining emissions at aggregated states.

References

1. V. W.-W. Yam, K. M.-C. Wong and N. Zhu, *J. Am. Chem. Soc.,* 2002, **124**, 6506-6507.
2. Z. Jiang, J. Wang, T. Gao, J. Ma, Z. Liu and R. Chen, *ACS Appl. Mater. Interfaces,* 2020, **12**, 9520-9527.
3. C. Yu, K. M.-C. Wong, K. H.-Y. Chan and V. W.-W. Yam, *Angew. Chem. Int. Ed.,* 2005, **44**, 791-794.
4. V. W.-W. Yam, K. H.-Y. Chan, K. M.-C. Wong and B. W.-K. Chu, *Angew. Chem. Int. Ed.,* 2006, **45**, 6169-6173.
5. A. Y.-Y. Tam, K. M.-C. Wong, G. Wang and V. W.-W. Yam, *Chem. Commun.,* 2007, 2028-2030.
6. M.-X. Zhu, W. Lu, N. Zhu and C.-M. Che, *Chem.–Eur. J.,* 2008, **14**, 9736-9746.
7. K. H.-Y. Chan, J. W.-Y. Lam, K. M.-C. Wong, B.-Z. Tang and V. W.-W. Yam, *Chem.–Eur. J.,* 2009, **15**, 2328-2334.
8. W. Lu, Y. Chen, V. A. L. Roy, S. S.-Y. Chui and C.-M. Che, *Angew. Chem. Int. Ed.,* 2009, **48**, 7621-7625.
9. C. Yu, K. H.-Y. Chan, K. M.-C. Wong and V. W.-W. Yam, *Chem. Commun.*, 2009, 3756-3758.
10. C. Y.-S. Chung, K. H.-Y. Chan and V. W.-W. Yam, *Chem. Commun.*, 2011, **47**, 2000-2002.
11. Y. Hu, K. H.-Y. Chan, C. Y.-S. Chung and V. W.-W. Yam, *Dalton Trans.*, 2011, **40**, 12228-12234.
12. N. Komiya, T. Muraoka, M. Iida, M. Miyanaga, K. Takahashi and T. Naota, *J. Am. Chem. Soc.*, 2011, **133**, 16054-16061.
13. N. Komiya, M. Okada, K. Fukumoto, D. Jomori and T. Naota, *J. Am. Chem. Soc.*, 2011, **133**, 6493-6496.
14. S. C. F. Kui, Y.-C. Law, G. S. M. Tong, W. Lu, M.-Y. Yuen and C.-M. Che, *Chem. Sci.*, 2011, **2**, 221-228.
15. C. Po, A. Y.-Y. Tam, K. M.-C. Wong and V. W.-W. Yam, *J. Am. Chem. Soc.*, 2011, **133**, 12136-12143.
16. C. A. Strassert, C.-H. Chien, M. D. Galvez Lopez, D. Kourkoulos, D. Hertel, K. Meerholz and L. De Cola, *Angew. Chem. Int. Ed.*, 2011, **50**, 946-950.
17. J. R. Berenguer, E. Lalinde, M. T. Moreno, S. Sánchez and J. Torroba, *Inorg. Chem.*, 2012, **51**, 11665-11679.
18. S. Liu, H. Sun, Y. Ma, S. Ye, X. Liu, X. Zhou, X. Mou, L. Wang, Q. Zhao and W. Huang, *J. Mater. Chem.*, 2012, **22**, 22167-22173.
19. C. Y.-S. Chung, S. P.-Y. Li, M.-W. Louie, K. K.-W. Lo and V. W.-W. Yam, *Chem. Sci.*, 2013, **4**, 2453-2462.
20. N. Komiya, T. Kashiwabara, S. Iwata and T. Naota, *J. Organomet. Chem.*, 2013, **738**, 66-75.
21. M. C.-L. Yeung and V. W.-W. Yam, *Chem. Sci.*, 2013, **4**, 2928-2935.
22. S. Yu-Lut Leung and V. Wing-Wah Yam, *Chem. Sci.*, 2013, **4**, 4228-4234.
23. C. Y. S. Chung and V. W. W. Yam, *Chem.–Eur. J.*, 2014, **20**, 13016-13027.

24. H. Honda, J. Kuwabara and T. Kanbara, *J. Organomet. Chem.*, 2014, **772-773**, 139-142.
25. H. Honda, Y. Ogawa, J. Kuwabara and T. Kanbara, *Eur. J. Inorg. Chem.*, 2014, 1865-1869.
26. Y. Li, D. P.-K. Tsang, C. K.-M. Chan, K. M.-C. Wong, M.-Y. Chan and V. W.-W. Yam, *Chem.–Eur. J.*, 2014, **20**, 13710-13715.
27. S. S. Pasha, P. Alam, S. Dash, G. Kaur, D. Banerjee, R. Chowdhury, N. Rath, A. Roy Choudhury and I. R. Laskar, *RSC Adv.*, 2014, **4**, 50549-50553.
28. Y. Yuan, Y. Chen, B. Z. Tang and B. Liu, *Chem. Commun.*, 2014, **50**, 3868-3870.
29. Y. Yuan, R. T. K. Kwok, B. Z. Tang and B. Liu, *J. Am. Chem. Soc.*, 2014, **136**, 2546-2554.
30. T. Ikeda, M. Takayama, J. Kumar, T. Kawai and T. Haino, *Dalton Trans.*, 2015, **44**, 13156-13162.
31. Y. Yuan, C.-J. Zhang and B. Liu, *Chem. Commun.*, 2015, **51**, 8626-8629.
32. A. Aliprandi, M. Mauro and L. De Cola, *Nat. Chem.*, 2016, **8**, 10-15.
33. F. Gou, J. Cheng, X. Zhang, G. Shen, X. Zhou and H. Xiang, *Eur. J. Inorg. Chem.*, 2016, 4862-4866.
34. S. S. Pasha, P. Alam, A. Sarmah, R. K. Roy and I. R. Laskar, *RSC Adv.*, 2016, **6**, 87791-87795.
35. S. Carrara, A. Aliprandi, C. F. Hogan and L. De Cola, *J. Am. Chem. Soc.*, 2017, **139**, 14605-14610.
36. H.-K. Cheng, M. C.-L. Yeung and V. W.-W. Yam, *ACS Appl. Mater. Interfaces,* 2017, **9**, 36220-36228.
37. A. S.-Y. Law, M. C.-L. Yeung and V. W.-W. Yam, *ACS Appl. Mater. Interfaces,* 2017, **9**, 41143-41150.
38. R. Liu, S. Zhu, J. Lu, H. Shi and H. Zhu, *Dyes Pigments*, 2017, **147**, 291-299.
39. Y. Ai, M. Ng, E. Y.-H. Hong, A. K.-W. Chan, Z.-W. Wei, Y. Li and V. W.-W. Yam, *Chem.–Eur. J.*, 2018, **24**, 11611-11618.
40. H.-L. Au-Yeung, S. Y.-L. Leung and V. W.-W. Yam, *Chem. Commun.*, 2018, **54**, 4128-4131.
41. S. Fang, S. Y. L. Leung, Y. Li and V. W. W. Yam, *Chem.–Eur. J.*, 2018, **24**, 15596-15602.
42. T. Ikeda, K. Hirano and T. Haino, *Mater. Chem. Front.*, 2018, **2**, 468-474.
43. S. S. Pasha, L. Fageria, C. Climent, N. P. Rath, P. Alemany, R. Chowdhury, A. Roy and I. R. Laskar, *Dalton Trans.*, 2018, **47**, 4613-4624.
44. J. Song, M. Wang, X. Zhou and H. Xiang, *Chem.–Eur. J.*, 2018, **24**, 7128-7132.
45. J. Wu, Y. Li, C. Tan, X. Wang, Y. Zhang, J. Song, J. Qu and W.-Y. Wong, *Chem. Commun.*, 2018, **54**, 11144-11147.
46. J. Zhao, Z. Feng, D. Zhong, X. Yang, Y. Wu, G. Zhou and Z. Wu, *Chem. Mater.*, 2018, **30**, 929-946.
47. Y. Ai, Y. Li, H. L.-K. Fu, A. K.-W. Chan and V. W.-W. Yam, *Chem.–Eur. J.*, 2019, **25**, 5251-5258.
48. C. Cuerva, J. A. Campo, M. Cano and C. Lodeiro, *Chem.–Eur. J.*, 2019, **25**, 12046-12051.
49. M. Ikeshita, M. Ito and T. Naota, *Eur. J. Inorg. Chem.*, 2019, 3561-3571.
50. A. S.-Y. Law, L. C.-C. Lee, M. C.-L. Yeung, K. K.-W. Lo and V. W.-W. Yam, *J. Am. Chem. Soc.*, 2019, **141**, 18570-18577.

51. N. H.-T. Le, R. Inoue, S. Kawamorita, N. Komiya and T. Naota, *Inorg. Chem.*, 2019, **58**, 9076-9084.
52. S. Lin, H. Pan, L. Li, R. Liao, S. Yu, Q. Zhao, H. Sun and W. Huang, *J. Mater. Chem. C*, 2019, **7**, 7893-7899.
53. L. Qu, C. Li, G. Shen, F. Gou, J. Song, M. Wang, X. Xu, X. Zhou and H. Xiang, *Mater. Chem. Front.*, 2019, **3**, 1199-1208.
54. J. Song, M. Wang, X. Xu, L. Qu, X. Zhou and H. Xiang, *Dalton Trans.*, 2019, **48**, 4420-4428.
55. S. Wang, W. Li, Y. Yu, J. Liu and C. Zhang, *Acta Physico-Chimica Sinica*, 2019, **35**, 1276-1281.
56. C. Cuerva, J. A. Campo, M. Cano, M. Caño-García, J. M. Otón and C. Lodeiro, *Dyes Pigments*, 2020, **175**, 108098.
57. B. Guo, M. Wu, Q. Shi, T. Dai, S. Xu, J. Jiang and B. Liu, *Chem. Mater.*, 2020, **32**, 4681-4691.
58. X. Hao, B. Xiong, M. Ni, B. Tang, Y. Ma, H. Peng, X. Zhou, I. I. Smalyukh and X. Xie, *ACS Appl. Mater. Interfaces*, 2020, **12**, 53058-53066.
59. T. Hirao, H. Tsukamoto, T. Ikeda and T. Haino, *Chem. Commun.*, 2020, **56**, 1137-1140.
60. Z. Jiang, J. Wang, T. Gao, J. Ma, Z. Liu and R. Chen, *ACS Appl. Mater. Interfaces*, 2020, **12**, 9520-9527.
61. M. Martínez-Junquera, R. Lara, E. Lalinde and M. T. Moreno, *J. Mater. Chem. C*, 2020, **8**, 7221-7233.
62. W. J. Mullin, H. Qin, T. Mani, P. Müller, M. J. Panzer and S. W. Thomas, *Chem. Commun.*, 2020, **56**, 6854-6857.
63. X. Wu, D.-G. Chen, D. Liu, S.-H. Liu, S.-W. Shen, C.-I. Wu, G. Xie, J. Zhou, Z.-X. Huang, C.-Y. Huang, S.-J. Su, W. Zhu and P.-T. Chou, *J. Am. Chem. Soc.*, 2020, **142**, 7469-7479.
64. B. Yang, H. Ni, H. Wang, Y. Hu, K. Luo and W. Yu, *J Phys. Chem. C*, 2020, **124**, 23879-23887.
65. X. Yang, L. Yue, Y. Yu, B. Liu, J. Dang, Y. Sun, G. Zhou, Z. Wu and W.-Y. Wong, *Adv. Opt. Mater.*, 2020, **8**, 2000079.
66. S. Zhu, J. Hu, S. Zhai, Y. Wang, Z. Xu, R. Liu and H. Zhu, *Inorg. Chem. Front.*, 2020, **7**, 4677-4686.
67. X. Chen, Y. Sun, X. Zhao, X. Deng, X. Yang, Y. Sun, G. Zhou and Z. Wu, *Mater. Chem. Front.*, 2021, **5**, 4160-4173.
68. C. Cuerva, J. Fernández-Lodeiro, M. Cano, J. L. Capelo-Martínez and C. Lodeiro, *Nano Res.*, 2021, **14**, 245-254.
69. B. Das and P. Gupta, *Dalton Trans.*, 2021, **50**, 10225-10236.
70. L. Di, Z. Xia, H. Wang, Y. Xing and Z. Yang, *Sensor. Actuat. B-Chem.*, 2021, **326**, 128987.
71. Z.-L. Gong, K. Tang and Y.-W. Zhong, *Inorg. Chem.,* 2021, **60**, 6607-6615.
72. R. Inoue, T. Naota and M. Ehara, *Chem. –Asian J.*, 2021, **16**, 3129-3140.
73. A. S.-Y. Law, L. C.-C. Lee, K. K.-W. Lo and V. W.-W. Yam, *J. Am. Chem. Soc.*, 2021, **143**, 5396-5405.
74. M. Martínez-Junquera, E. Lalinde, M. T. Moreno, E. Alfaro-Arnedo, I. P. López, I. M. Larráyoz and J. G. Pichel, *Dalton Trans.*, 2021, **50**, 4539-4554.

75. W. Tao, Y. Chen, L. Lu and C. Liu, *Tetrahedron Lett.*, 2021, **66**, 152802.
76. L. Wang, H. Xiao, L. Qu, J. Song, W. Zhou, X. Zhou, H. Xiang and Z.-X. Xu, *Inorg. Chem.*, 2021, **60**, 13557-13566.
77. H. Yang, H. Li, L. Yue, X. Chen, D. Song, X. Yang, Y. Sun, G. Zhou and Z. Wu, *J. Mater. Chem. C*, 2021, **9**, 2334-2349.
78. L. Di, Z. Wang, Z. Yu, Q. Cao, H. Wang, Y. Xing, Z. Yang and Z. Xia, *Dyes Pigments*, 2022, **205**, 110582.
79. J. Song, H. Xiao, L. Fang, L. Qu, X. Zhou, Z.-X. Xu, C. Yang and H. Xiang, *J. Am. Chem. Soc.*, 2022, **144**, 2233-2244.
80. Y. Sun, C. Zhu, S. Liu, W. Wang, X. Chen, G. Zhou, X. Yang and W.-Y. Wong, *Chem. Eng. J.*, 2022, **449**, 137457.
81. H.-H. Zhang, S.-X. Wu, Y.-Q. Wang, T.-G. Xie, S.-S. Sun, Y.-L. Liu, L.-Z. Han, X.-P. Zhang and Z.-F. Shi, *Dyes Pigments*, 2022, **197**, 109857.
82. E. K.-H. Wong, M. H.-Y. Chan, W. K. Tang, M.-Y. Leung and V. W.-W. Yam, *J. Am. Chem. Soc.*, 2022, **144**, 5424-5434.
83. B. Li, Y. Wang, M. H.-Y. Chan, M. Pan, Y. Li and V. W.-W. Yam, *Angew. Chem. Int. Ed.*, 2022, **61**, e202210703.
84. Z. Fang, D. Chen, J. Xu, J. Wang, S. Li, X. Tian, Y. Tian and Q. Zhang, *Anal. Chem.*, 2022, **94**, 14769-14777.
85. H.-H. Zhang, J. Jing, G. Xu, Y.-X. Song, S.-X. Wu, X.-H. Chen, D.-S. Zhang, X.-P. Zhang and Z.-F. Shi, *Heliyon*, 2022, **8**, e11358.
86. C. Li, L. Xu, X. Chen, Z. Chi, B. Xu and J. Zhao, *Dyes Pigments*, 2023, **209**, 110912.
87. M.-J. Kim, M. Chae, M. Ahn and K.-R. Wee, *Adv. Opt. Mater.*, 2023, **11**, 2202983.
88. N. Zhou, C. Zou, S. Suo, Y. Liu, J. Lin, X. Zhang, M. Shi, X. Chang and W. Lu, *Dalton Trans.*, 2023, **52**, 5503-5513.
89. J. Song, H. Xiao, B. Zhang, L. Qu, X. Zhou, P. Hu, Z.-X. Xu and H. Xiang, *Angew. Chem. Int. Ed.*, 2023, **62**, e202302011.
90. D. Tauchi, T. Koida, Y. Nojima, M. Hasegawa, Y. Mazaki, A. Inagaki, K.-i. Sugiura, Y. Nagaya, K. Tsubaki, T. Shiga, Y. Nagata and H. Nishikawa, *Chem. Commun.*, 2023, **59**, 4004-4007.
91. S. T. Borah, B. Das, P. Biswas, A. I. Mallick and P. Gupta, *Dalton Trans.*, 2023, **52**, 2282-2292.
92. A. Lázaro, R. Bosque, J. S. Ward, K. Rissanen, M. Crespo and L. Rodríguez, *Inorg. Chem.*, 2023, **62**, 2000-2012.
93. Y. Yan, W. Jia, L. Zhang and C. Liu, *Dyes Pigments*, 2023, **220**, 111719.
94. J. Wu, B. Xu, Y. Xu, L. Yue, J. Chen, G. Xie and J. Zhao, *Inorg. Chem.*, 2023, **62**, 19142-19152.