Pressure Induced Emission

G. Xiao[1], K. Wang[1], X. Yang[1], and B. Zou[1]*

[1]*State Key Laboratory of Superhard Materials, Jilin University, China*

Keywords: Pressure Induced Emission; Exciton; Ligand

*e-mail: zoubo@jlu.edu.cn

The fluorescence of most luminescent materials exhibits a pressure caused quenching (PCQ). However, a few luminescent materials experience a pressure induced emission (PIE). Our group has revealed four mechanisms of PIE. The first is based on aggregation induced emission materials. Pressure will restrict the intramolecular rotation or vibration, thus decreasing the non-radiative transition, and resulting in the PIE of luminescent materials.[1-3] The second is based on the pressure-strengthened exciton binding energy, thus leading to the PIE.[4-7] The third is pressure-modulated transition channels, making the PIE of defects of materials. The fourth is the regulation of interaction between ligands and nanomaterials, which makes the PIE of a series of nanomaterials.[8] These results will enrich the research directions of high-pressure chemistry and show potential applications in the fields of pressure switches and pressure sensors.

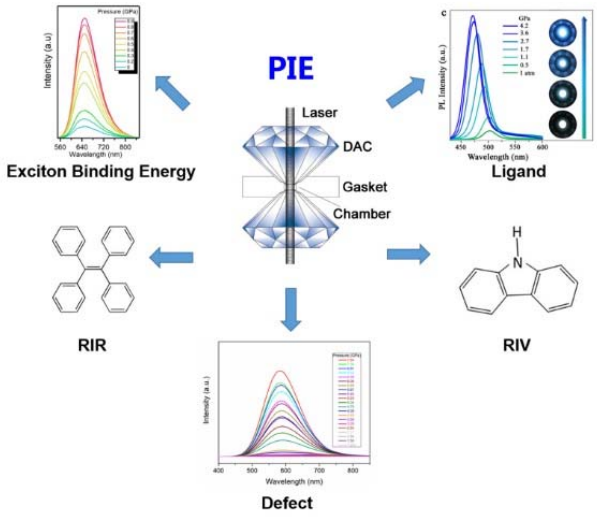

Figure 1. Mechanism of pressure induced emission

Acknowledgments: This work is supported by the National Science Foundation of China (Nos. 21725304, and 21673100), the Chang Jiang Scholars Program of China (No. T2016051). The Angle-dispersive XRD measurement was performed at the BL15U1 beamline, Shanghai Synchrotron Radiation Facility (SSRF) and 4W2 HP-Station, Beijing Synchrotron Radiation Facility (BSRF) which is supported by Chinese Academy of Science (Grant Nos. KJCX2-SW-N20 and KJCX2-SW-N03).

[1] H. Yuan, K. Wang, K. Yang, B. Liu, and B. Zou, *J. Phys. Chem. Lett.* 2014, **5**, 2968.
[2] Y. Gu, K. Wang, Y. Dai, G. Xiao, Y. Ma, Y. Qiao, and B. Zou, *J. Phys. Chem. Lett.* 2017, **8**, 4191.
[3] S. Zhang, Y. Dai, Y. Gao, S. Luo, K. Wang, B. Zou, B. Yang, and Y. Ma, *Adv. Funct. Mater.* 2017, **27**, 1602276.
[4] L. Zhang, C. Liu, L. Wang, C. Liu, K. Wang, and B. Zou, *Angew. Chem. Int. Ed.* 2018, **57**, 11213.
[5] Z. Ma, Z. Liu, S. Lu, L. Wang, X. Feng, D. Yang, K. Wang, G. Xiao, L. Zhang, S. A. T. Redfern, and B. Zou, *Nature Commun.* 2018, **9**, 4506.
[6] L. Zhang, L. Wu, K. Wang, and B. Zou, *Adv. Sci.* 2019, **6**, 201801628.
[7] Y. Shi, Z. Ma, D. Zhao, Y. Chen, Y. Cao, K. Wang, G. Xiao, and B. Zou, *J. Am. Chem. Soc.* 2019, **141**, DOI:10.1021/jacs.9b02568.
[8] G. Xiao, Y. Wang, D. Han, K. Li, X. Feng, K. Wang, L. Liu, S. A. T. Redfern, and B. Zou, *J. Am. Chem. Soc.* 2018, **140**, 13970.