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Prof. Su-Yuan Xie was born in 1968 and grew up in Fujian, China, where he studied chemistry at Fujian Normal University, Fuzhou, from 1984 to 1988. During 1988-1991, he studied at Central South University (Changsha) and then at Kunming Research Institute of Noble Metal (Kunming) for the Master's degree. He joined the group of Professor Lan-Sun Zheng at Xiamen University to pursue his Ph.D degree in 1996, then continued to work at Xiamen University as a faculty after receiving his Ph.D in 1999. As a visiting scientist, he worked at Clemson University, USA, during 2003-2005. He worked at Cardiff University, UK, as a visiting professor in 2017.

His research focuses on synthesis and photovoltaic properties of fullerenes, a family of cage-like all-carbon molecules typically consisting of hexagons and 12 pentagons. Topologically, the number of possible fullerene isomers are huge, but only a tiny fraction of them can survive in air and be isolated in the solid state. The 'missing' fullerenes, normally consisting fused pentagons and rendering unusual properties, are elusive and of challenge to synthesize. He has been able to bring thirty 'missing' fullerenes into reality by using the strategy of exohedral derivatization. By chlorination (or hydrogenation) in carbon arc (or flame), 40% of the already-known fused-pentagon fullerenes ranging from C_{50} to C_{78} in the forms of chlorides (or hydrides) were synthesized in his research group.

Fullerene Electron Acceptor Materials for Organic-Inorganic Solar Cells
有机-无机太阳能电池的富勒烯电子受体材料

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在新一代的有机-无机太阳能电池（如钙钛矿太阳能电池）中，富勒烯可作为电子传输层、界面层或钝化层的材料得以应用，以提高钙钛矿太阳能电池的光电转换效率，减小电流迟滞现象，并提高器件稳定性[1]。我们应用富勒烯（C_{60} 和 C_{70}）通过溶液过程制备了效率为 14%的钙钛矿太阳能电池[2]；在氧化铈（CeO_x, x=1.87）电子传输层中掺入 C_{60} 的苯基丁酸甲脂衍生物（$PC_{61}BM$），将钙钛矿太阳能电池的效率从 14% 提高到 17%[3-4]；在典型的 TiO_2 电子传输层中掺入富勒烯吡咯烷衍生物，将钙钛矿太阳能电池的效率进一步提高到 19.1%，而且器件的迟滞和光漂白得到有效抑制；而通过低温（120ºC）溶液过程将未经修饰的 C_{60} 掺入 TiO_2 中，将钙钛矿太阳能的电池效率提高到 19%以上，为制备新型的柔性有机-无机太阳能电池创造了条件[5]。

参考文献

[1] Deng, L. L.; Xie, S. Y.; Gao F. Fullerene-Based Materials for Photovoltaic Applications: Toward Efficient, Hysteresis-Free, and Stable Perovskite Solar Cells, Adv. Electron Mater., 2017, 1700435.

[2] Dai, S. M.; Tian, H. R.; Zhang, M. L.; et al. Pristine fullerenes mixed by vacuum-free solution process: Efficient electron transport layer for planar perovskite solar cells, J. Power Sources, 2017, 339, 27-32.

[3] Wang, X.; Deng, L. L.; Wang, L. Y.; et al. Cerium oxide standing out as an electron transport layer for efficient and stable perovskite solar cells processed at low temperature, J. Mater. Chem. A, 2017, 5, 1706-1712.

[4] Xing, Z.; Li, S. H.; Wu, B. S.; et al. Photovoltaic performance and stability of fullerene/cerium oxide double electron transport layer superior to single one in p-i-n perovskite solar cells, J. Power Sources, 2018, 389, 13-19.

[5] Zhou, Y. Q.; Wu, B. S.; Lin, G. H.; et al. Interfacing Pristine C_{60} onto TiO_2 for Viable Flexibility in Perovskite Solar Cells by a Low-Temperature All-Solution Process, Adv. Eenery Mater., 2018, 1800399