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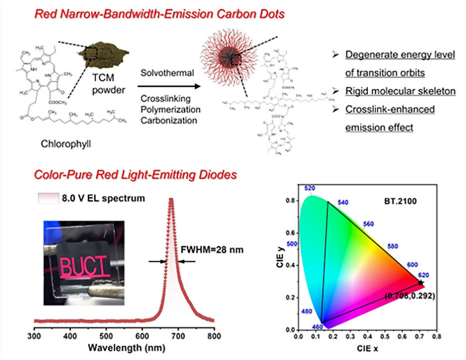
**Chlorophyll-structured carbon dots achieve high color purity and luminescence for future, non-toxic, biocompatible, and affordable LEDs.**




Light-emitting diodes (LEDs) illuminate the world, directing cars in traffic lights, decorating rooms with multicolored string lights, and potentially even displaying this article on a computer screen. To enhance color purity and achieve ultra-high definition, researchers strive to narrow the band of wavelengths emitted. Though semiconductor quantum dots and perovskite luminescent materials offer promising solutions, they can be expensive and toxic to the environment.

Carbon dots provide a lower-cost, non-toxic, and biocompatible alternative with better optical properties. Dang et al. demonstrate this potential with chlorophyll-structured carbon dots (CHL-CDs) derived from traditional Chinese medicine leaves. The CHL-CDs emit a high-purity red light, and the team identified the factors required to emit other colors.

“Inspired by the narrow-bandwidth-emission characteristic of chlorophyll derivates, we decided to use leaves to synthesize carbon dots,” said author Zhan’ao Tan. “Compared with fresh leaves, the composition of the traditional Chinese medicine powder is relatively fixed, which makes the experimental repeatability better. Because the medicinal benefits of some traditional Chinese medicinal leaves lie in their rich chlorophyll content, they are ideal candidates for use in CHL-CDs.”

The team synthesized the CHL-CDs using a solvothermal reaction and silica gel column chromatography. Loquat leaves produced the highest photoluminescence, though folium isatidis and Chinese holly also achieved favorable spectral shapes.

“The obtained CHL-CDs could exhibit bright red photoluminescence centered at 671 nm and ultra-high color purity with a full-width half-maximum of only 23 nm,” said Tan. “In this publication, we have studied the inherent influence factors of emission bandwidth. Based on this, we plan to choose the appropriate precursors to synthesize green and blue narrow-bandwidth-emission CDs.

**Source:** “Crosslinking polymerization and carbonization of biomass chlorophyll for carbon dots-based electroluminescent devices with ultra-narrow-emission,” by Qi Dang, Biao Zhao, Mengyun Zheng, Chengyang Zhang, Runnan Yu, Songnan Qu, Haoran Jia, and Zhan’ao Tan, *Applied Physics Reviews* (2024). The article can be accessed at https://doi.org/10.1063/5.0184547.