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Beryllium-Assisted p-Type Doping for ZnO Homojunction Light-Emitting Devices

By

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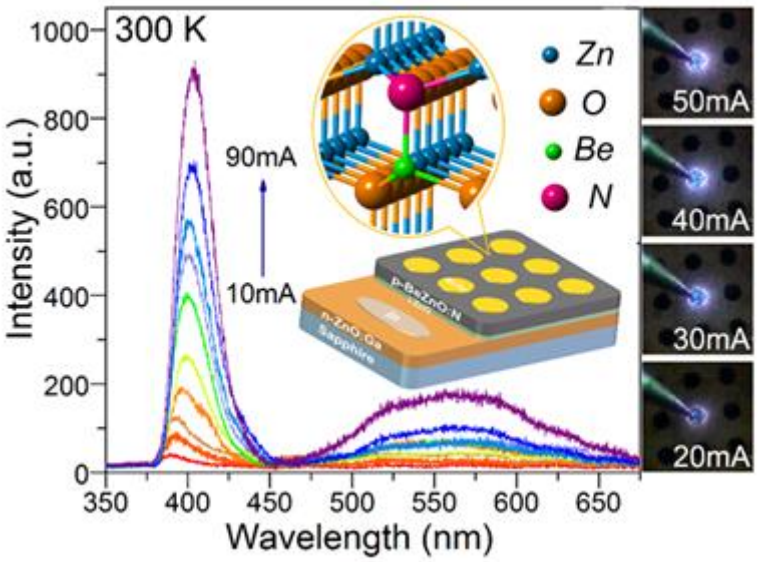
Abstract

White-light sources based on reliable and energy-efficient UV LEDs are emerging as an indispensable solid-state light source for the next generation lighting industry. In contrast with GaN, ZnO has substantial advantages including high optical gain (350 cm^{-1}) and large exciton binding energy (60 meV) which is much larger than that of GaN (25 meV). These features suggest that high-efficiency UV LEDs or laser diodes durable at high power and high temperature operation can be realized in the ZnO-based materials. However, ZnO suffers notoriously doping asymmetry problem. It is very difficult for p-type doping but easy for n-type doping, which hinders the application of ZnO optoelectronic profoundly.

A key step in realization of a ZnO homojunction light-emitting diode is the effective p-type doping in ZnO:N. We present a feasible route to enhance hole doping in ZnO:N films by the assistance of Beryllium. The newly synthesized p-type ZnO is applied in light-emitting devices. The corresponding p–i–n junction exhibits excellent diode characteristics, and strong near band edge ultraviolet emissions is also observed even at temperatures as high as 400 K under the

injection of continuous current. The results represent a critical advance toward the development of high-efficiency and stabilized p-type ZnO, which is also a desirable key step for future ZnO-based optoelectronic applications.



Biography

Anqi Chen is currently the Research Assistant in School of Physics of Sun Yat-sen University, Guangzhou, China and she obtained the Bachelor of Science in School of Natural and Applied Sciences, Northwestern Polytechnical University, China in 2012.

Her research areas include Epitaxy growth of ZnO related materials, ZnO based optoelectronic devices.

All are Welcome!