Near-infrared mechanoluminescence of ZnO co-doped with Li and Nd

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Mechanoluminescence (ML) induced by elastic deformation has attracted considerable scientific interest in recent years.[1] These materials have potential applications in stress sensing across various scales, from nano to macro. Particularly, ML materials that can emitt near-infrared light (NIR ML) have become a focus of attention for medical and biological uses, as near-infrared light has advantages in reduced scattering and absorption in biological tissues. Zinc oxide (ZnO) has emerged as a promising candidate for such applications because of its high biocomcompatibility. Furthermore, the relatively low cost of ZnO makes it an attractive choice for widespread adoption. Consequently, this study selected ZnO as the primary material for investigation.

ZnO co-doped with Li and Nd (ZnO: Nd, Li) exhibited distinctive NIR ML behavior under mechanical loading. The load-dependent measurements demonstrated that the emission intensity was simultaneously increased with applied load.The density functional theory (DFT) calculations have revealed that co-doping ZnO with Li and Nd leads to crystal softening, suggesting enhanced deformation susceptibility and improved luminescence efficiency.[2] In conclusion, ZnO co-doped with Li and Nd was successfully synthesized, and near-infrared ML from a ZnO-based material has been realized for the first time.

References

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