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# 【138】Advancements in In-free III-nitride heterostructures emitting in the near infrared

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Heterostructures based on Al<sub>$x$</sub>Ga<sub>1-$x$</sub>N are the building blocks of state-of the-art high-power and optoelectronic devices working in the visible and ultra-violet range. It was recently found, that the self-assembly of Mn-Mg<sub>$k$</sub> complexes in epitaxial GaN:(Mn,Mg) and Al<sub>$x$</sub>Ga<sub>1-$x$</sub>N:(Mn,Mg) allows extending the emission spectra of these In-free compounds to the (near) infrared (IR). Here, through a combination of photoluminescence excitation spectroscopy and theoretical computational analysis based on density functional theory, the most efficient emission channels are identified. Furthermore, by embedding a GaN:(Mn,Mg) active layer between Al<sub>$x$</sub>Ga<sub>1-$x$</sub>N:Mn/GaN distributed Bragg reflectors or layers of porous GaN, the efficiency of the IR emission is significantly enhanced.

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