

Development of UV-C light Source in 180-190 nm Spectral Range using Rocksalt-structured MgZnO Alloys

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The Minamata Convention on Mercury is advancing the regulation of mercury products. However, low-pressure mercury lamp is exempted from the regulation. The 185 nm emission is widely utilized as a light source for oxygen dissociation, ozone generation, and OH radical production in water treatment, while the 254 nm emission is widely used for UV sterilization. Although AlGaIn-based deep UV LEDs are becoming promising alternative to the 254 nm emission, almost no effort has been made to replace the 185 nm emission.

Behind the background, we have studied rocksalt (RS)-structured MgZnO alloys as candidate materials for UV-C emitters in 180-190 nm spectral range. Our group has reported growth of atomically-flat single crystalline RS-MgZnO films on MgO (100) substrates by using the mist chemical vapor deposition (mist CVD) method [1-3]. Observations of deep UV cathodoluminescence (CL) have been reported [1-6]. Post-growth slow-cooling process was used to improve the crystallinity and emission properties [7]. A near-band-edge emission was eventually achieved in the 187–223 nm spectral range at 300 K. Our group also succeeded in growing RS-MgZnO polycrystalline films on quartz glass substrates using the mist CVD [8]. The achievement brought us a demonstration of RS-MgZnO-based UV-C lamp emitting in 190-220 nm spectral range using 146 nm line of Kr²⁺ generated by dielectric barrier discharge as an excitation light source [9]. The progresses and recent achievements in growth of RS-MgZnO/MgO multiple quantum well structures will be discussed.

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