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Boron nitride

- Next-generation nitride semiconductor -

Motivation

Hexagonal and wurtzite boron nitride (BN) are promising materials for optical device applications in the deep ultraviolet (UV) spectral region and expected to form alloys with conventional nitride semiconductors. However, there has been no report of high-quality BN thin films and the fundamental properties of BN remains to be clarified.

Originality

We have achieved the growth of single-crystal hexagonal BN thin films on Ni(111) substrate by flow-rate modulation epitaxy (FME) and observed ultraviolet luminescence at room temperature from them. In addition, wurtzite $Al_{1-x}B_xN$ (x-0.015) thin films were successfully fabricated using FME on 4H-SiC substrates.

Impact

By establishing a high-quality growth technique for BN thin films and clarifying their fundamental properties, BN semiconductors will become a promising addition to the nitride semiconductor family for high-performance deep UV optical devices application.

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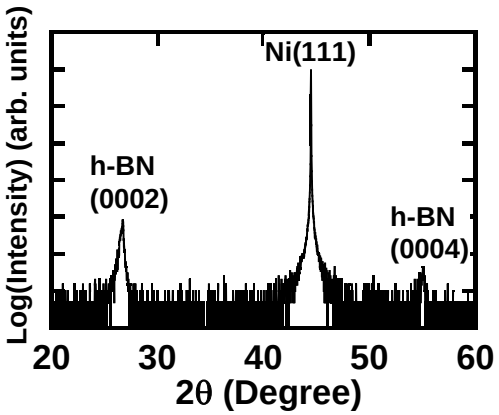
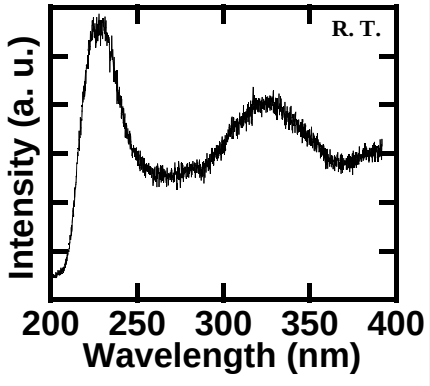
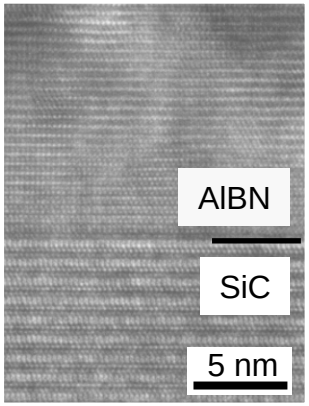


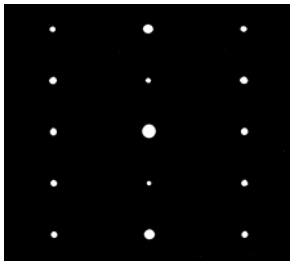
X-ray diffraction pattern of single-crystal hexagonal BN thin film grown on Ni substrate.



Cathodoluminescence spectra at room temperature from the single-crystal hexagonal BN thin film.



A lattice image obtained by cross-sectional high-resolution transmission electron microscopy around the AlBN thin film-substrate interface.



Selected area diffraction from wurtzite AlBN thin film.