AlN single crystal growth on sapphire substrate under atomic nitrogen plasma

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GaN and InN are promising materials for optoelectronic device applications such as light-emitting diodes (LEDs) and laser diodes (LDs). The method to prevent a large mismatch with sapphire substrate and to avoid the high equilibrium pressure and temperature environment is required to grow high crystalline GaN and InN. The paper demonstrates the effects of sapphire (Al_2O_3) substrate nitridation with plasma mixture of nitrogen. A (0001) sapphire substrate with atomically smooth surface was placed into a pyrolytic boron nitride crucible. Nitridation was performed for 2 to 4 h at 680 ˚C. AlN was formed by Al_2O_3 substrate nitridation. XRD patterns was shown It shows that the layer was nearly oriented to (0001)AlN//(0001) sapphire substrate. We have carried out experiments to grow thick single InN crystal films for use as substrate. It was successfully that AlN was formed to Al_2O_3 substrate nitridation by microwave plasma. By using same growth apparatus, the transparent GaN layer was grown on AlN/Al_2O_3 substrate by using plasma mixture of nitrogen and hydrogen.