Electrically conductive DLC coatings by plasma based ion implantation

Electrically conductive DLC(diamond-like carbon) coating technique has been developed by plasma based ion implantation with bipolar pulses. Energetic electrons and ions, which were induced by positive and negative pulses, respectively, were bombarded/deposited alternately on a substrate in hydrocarbon plasma. As a result, the resistivity of the DLC film decreased with the negative pulse voltage, and reached to 1 mΩcm at -20kV. Hardness of the film was 5.4GPa. TEM observation showed that the electrically conductive DLC films are composed of cluster of graphite-like aggregates. The technique can be applied for a metal separator in fuel batteries, where high conductivity and high electrochemical stability are needed.

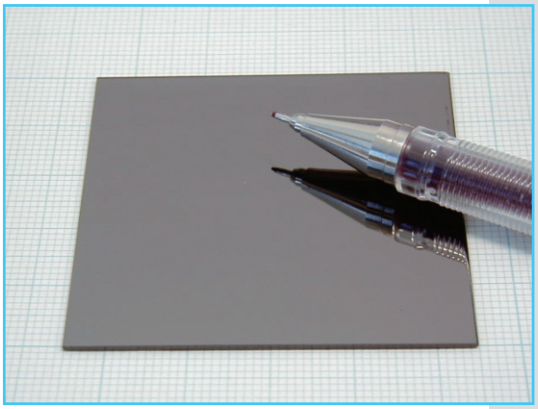

Fig. Electrically conductive DLC film coated on a stainless steel substrate.

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A new growth technique for high-quality III-nitride semiconductors

We propose a new technique for the growth of high-quality III-nitride semiconductors with ultra-flat surface morphologies and low dislocation density. The key-point of the technique is the use of vicinal sapphire (0001) substrates for the growth. We use plasma-assisted molecular beam epitaxy to grow the films. As a result, ultra-flat surface with mono-layer steps is achieved using a 0.5° vicinal substrates. Furthermore, the dislocation density in the GaN film grown on a 2.0° vicinal substrate is greatly reduced to the order of $10^8/cm^2$, which is more than one order lower than that grown on a usual just-oriented substrate. The technique provides a new chance for the high performance of III-nitrides-based optical and electronics devices.

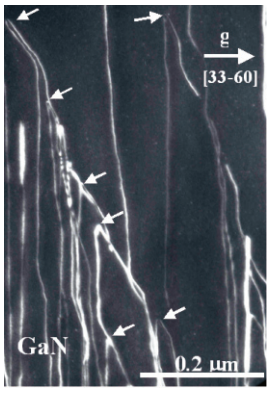

Fig. Dark-field TEM image of a GaN film grown on a 2 degree-off sapphire(0001) substrate. The threading dislocations are indicated by white lines,and the dislocation loops are shown by arrows.

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