ABSTRACT

A substrate 103 is set in a film-forming apparatus, such as a metal organic vapor phase epitaxy system 101, and a GaN buffer film 105, an undoped GaN film 107, and a GaN film 109 containing a p-type dopant are successively grown on the substrate 103 to form an epitaxial substrate E1. The semiconductor film 109 also contains hydrogen, which was included in a source gas, in addition to the p-type dopant. Then the epitaxial substrate E1 is placed in a short pulsed laser beam emitter 111. A laser beam L_{B1} is applied to a part or the whole of a surface of the epitaxial substrate E1 to activate the p-type dopant by making use of a multiphoton absorption process. When the substrate is irradiated with the pulsed laser beam L_{B1} which can induce multiphoton absorption, a p-type GaN film 109a is formed. There is thus provided a method of optically activating the p-type dopant in the semiconductor film to form the p-type semiconductor region, without use of thermal annealing.