mechanism \((a_{3,2} \text{ and } \tau_{3,2})\) and the third mechanism \((a_{3,3} \text{ and } \tau_{3,3})\) of H release in the third model (Eq. 6.9), respectively.

The saturation value \(a_{3,3} (2.8)\) and the exponential decay with time constant \(\tau_{3,3} (7000)\) of the third mechanism of H release (H release through Pd film by applying current flow during annealing) are highest compared to the saturation values and exponential decay with time constant of other mechanisms of all the models. These values indicate that the H release has been significantly enhanced by this mechanism. Greater amount of H is released and the mechanism of H release occurring much longer before start to saturate. As shown in the Fig. 6.5, the current value is still increasing even after annealing for 10000 s, i.e., the H release is still occurring and electrical conduction of the contact is keep improved even after annealing for 10000 s.

From these results, it can be understand that by applying current flow during annealing and forming a contact with material that H can diffuse into, the H release from GaN substrate can be enhanced and the electrical conduction of p-type GaN contact can be significantly improved.

### 6.4 Summary

In this chapter, in order to improve the electrical conduction of Mg-doped p-type GaN contacts, enhancement of hydrogen release from GaN substrates is attempted. The electrical conduction profiles of the p-type GaN/Ni contact annealed at 573 K and 673 K for 3600 s while subjected to current flow show some improvement compared to the contact annealed without applying the current flow. From these results, it can be understood that by applying current flow through the GaN substrates during annealing process, hydrogen release form GaN substrates can be enhanced by even annealing at low
temperature. To understand the mechanism of hydrogen release by applying current flow during annealing, the change in current values p-type GaN contacts during annealing has been observed. By using regression analysis and kinetic model, the electrical conduction improvement achieved by applying current flow through GaN substrate during annealing have been analysis. The results suggest that by applying current flow during annealing and by forming a contact with material that H can diffuse into such as Pd, the H release from GaN substrate can be enhanced and the electrical conduction of p-type GaN contact can be significantly improved.

References:


