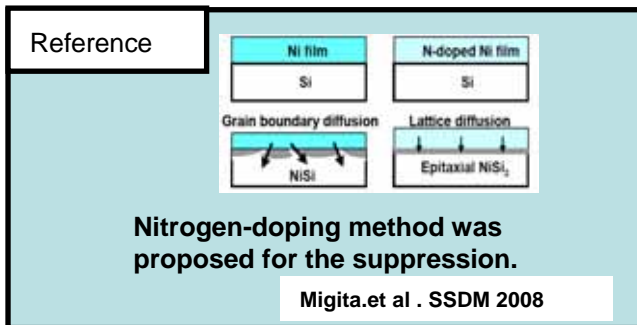
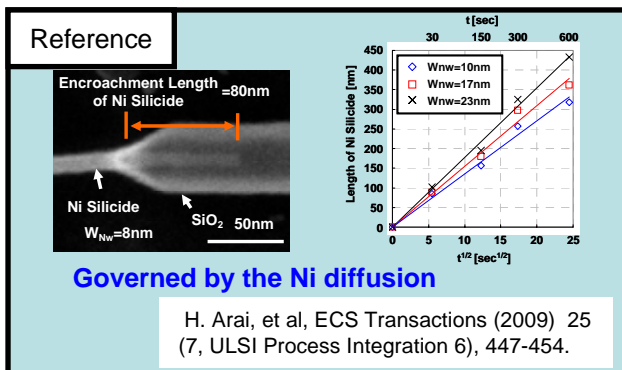
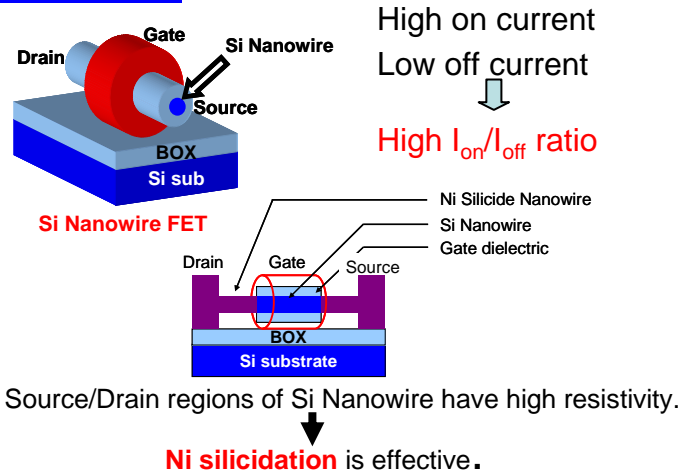


An effective suppression process for Ni silicide encroachment into Si nanowire

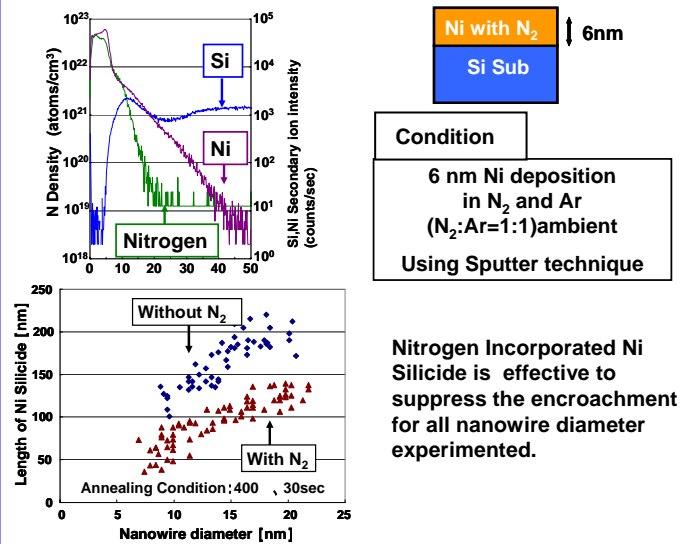
Tokyo Tech. FRC¹, Tokyo Tech. IGSSE² N.Shigemori¹, S. Sato¹, K. Kakushima², P. Ahmet¹, A. Nishiyama², K. Tsutsui², N. Sugii², K. Natori¹, T. Hattori¹, and H. Iwai¹

Introduction

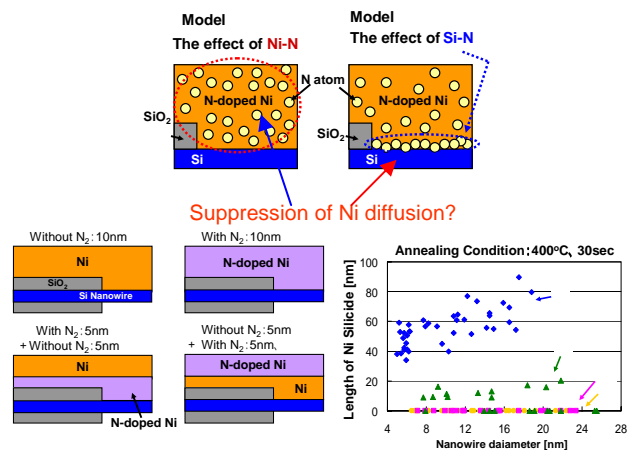


Experiment

- Si patterning
- Si Nanowire formation by Thermal Oxidation (Dry O₂, 1000°C, 45min)
- Partial oxide removal
- 6nm Ni deposition in N₂ and Ar (N₂:Ar=1:1) ambient Using Sputter technique
- Rapid Thermal Annealing (RTA) in N₂ ambient
- Unreacted Ni removal
- Observation by SEM (Acceleration voltage : 10keV)

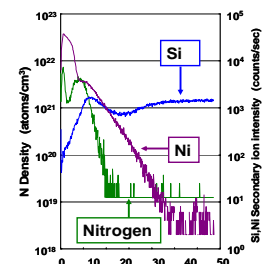
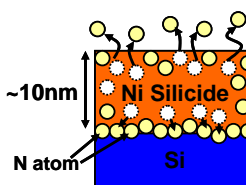


Suppression model of nitrogen Incorporation



Model2(Si-N formation model) is more plausible.

RTA: 400 °C, 30sec



Although most nitrogen introduced into Ni film desorbed during the silicidation anneal, a trace amount of nitrogen atoms reside at the interface.

Conclusion

- Nitrogen Incorporated Ni Silicide is effective to suppress the encroachment for all Nanowire diameter experimented.
- Suppression of Ni diffusion using Nitrogen Incorporation is attributed to thin Si-N layer on the surface of Si Nanowire.