

Influence of heat treatment on lateral lifetime charge carrier and its homogeneity in *n*-type silicon wafers

*M. N. Vil'dyaeva*¹, *E. A. Klimanov*^{1,2}, *A. V. Lyalikov*¹, *E. A. Makarova*¹,
and *P. S. Skrebneva*¹

¹ Orion R&P Association, JSC
9 Kosinskaya st., Moscow, 111538, Russia
E-mail: klimanov3@mail.ru

² MIREA – Russian Technological University (RTU MIREA)
78 Vernadsky Ave., Moscow, 119454, Russia

Received June 01, 2022

It is shown, that heat treatment Czochralski silicon wafers (Cz-Si) in oxygen and nitrogen ambient at 1150 °C during initial part of device processing sequence increase in homogeneity of the lateral lifetime charge carrier distribution over wafer. The reason this results is forming denuded zone with low oxygen concentration at wafer surfaces during heat treatment, where oxygen precipitates growth is suppressed.

Keywords: carrier lifetime, oxygen precipitates, diffusion of boron and phosphorus.

DOI: 10.51368/1996-0948-2022-3-43-48

REFERENCES

1. Chun-lan Zhou, Wen-Jing Wang, Hai-Ling Li, Lei Zhao, Hong-Wei Diao, and Li-Xu-Dong, Chinese Physical Letters **25** (06), 3005 (2008).
2. J. Haunschild, I. T. Reis, J. Geilker, and S. Rein, Physica Status Solidi RRL, No. 5-6, 199 (2011).
3. A. Le Donne, S. Binetti, V. Folegatti, and G. Coletti, Applied physics letters **109**, 033907 (2016).
4. M. N. Vil'dyaeva, S. S. Demidov, E. A. Klimanov, A. V. Lyalikov, and A. S. Fokina, Usp. Prikl. Fiz. **5** (3), 282 (2017).
5. R. J. Falster, M. Cornara, D. Gombaro, and M. Ohno, Solid State Phenom. **57-58**, 123 (1997).
6. R. Basnet, F. E. Rougieux, C. Sun, S. P. Phang, C. Samundsett, R. Einhaus, J. Degoulange, and D. Macdonald, IEEE Journal of Photovoltaics **8** (4), 990 (2018).
7. V. LaSalvia, A. Yossef, M. A. Jensen, E. E. Looney, W. Nemeth, M. Page, W. Nam, T. Buonassisi, and P. Stradins, Proc. Photovolt. Res. Appl., p. 1–8 (2018). <https://doi.org/10.1002/pip.3068>
8. R. F. Craven and H. W. Korb, Solid-State Technology, No. 7, 55 (1981).
9. M. N. Vil'dyaeva, E. A. Klimanov, M. A. Nuri, and P. S. Skrebneva, Applied Physics, No. 2, 46 (2019) [in Russian].
10. T. Y. Tan and W. J. Taylor, Semiconductor and Semimetals **42**, 353–390 (1984).
11. J. C. Mikkelsen, Mater. Res. Symp. Proc. **59**, 19 (1985).
12. J. D. Murphy, R. E. McGuire, K. Bothe, V. V. Voronkov, and R. J. Falster, Journal of Applied Physics **116**, 053514 (2014).
13. V. V. Novikov, *Teoreticheskie osnovy mikroelektroniki* (Vyssh. Shkola, Moscow, 1972).