PACS: 78.60.Kn

Cathodo- and thermoluminescence laser-nanostructured α-Al_2O_3 ceramics

S. V. Smirnov, K. V. Zhuk, and E. V. Savruk

Tomsk State University of Control Systems and Radioelectronics (TUSUR)
40 Lenina Ave., Tomsk, 634050, Russia
E-mail: klavdiya_95k@mail.ru

Received May 24, 2022

The results of studies of the optical properties of nanostructured samples of alumina ceramics are presented. It has been established that laser treatment of the sample surface leads to a significant change in the composition and structure of the near-surface layer. The methods of optical spectroscopy, cathodoluminescence and thermoluminescence revealed generation in alumina ceramics during laser treatment of an increased concentration of F-centers and their derivatives. The possibility of using nanostructured alumina ceramics in the creation of highly sensitive dosimeters for ultraviolet and X-ray radiation is shown.

Keywords: alumina ceramics, laser nanostructuring, cathodoluminescence, thermoluminescence.

DOI: 10.51368/1996-0948-2022-5-49-53

REFERENCES

1. V. S. Kortov, I. I. Mil`man, and S. V. Nikiforov, Izvestiya TPU **303** (2), 35 (2000).
2. E. G. Ykiharara, R. Gasa, S. W. McKeever, and C. G. Soares, Rad. Measurements **38**, 59 (2004).
3. S. V. Solovev, I. I. Mil`man, and A. I. Syurdo, Fizika tverdogo tela **54** (4), 683 (2012).
4. V. S. Kortov and S. V. Nikiforov, Nanosistemy`, nanomaterialy`, nanotekhnologii **9** (1), 41 (2011).
5. S. V. Zvonarev and N. O. Smirnov, Fizika tverdogo tela **61** (5), 934 (2019).
6. S. Ansell, S. Krishnan, J. K. R. Weber, J. J. Felten, P. C. Nordine, M. A. Beno, D. L. Price, and M. L. Saboungi, Physical Review Letters **78** (3), 464 (1997).
7. S. A. Ghyngasov, V. A. Kostenko, and N. N. Koval, Russian Phys. Journal **64** (2), 367 (2021).
8. A. A. Lisachenko and A. A. Glebovskij, Pisma v ZhTF **26** (7), 87 (2000).
9. A. A. Glebovskij, I. F. Moiseenko, and A. A. Lisachenko, Izvestiya AN SSSR, ser. Fizicheskaya **53** (3), 568 (1989).
10. S. V. Smirnov, S. M. Shandarov, and V. V. Karanskij, Usp. Prikl. Fiz. **9** (3), 224 (2021).
11. E. V. Savruk and S. V. Smirnov, Doklady TUSUR **1** (2), 123 (2010).
12. E. V. Savruk, S. V. Smirnov, and A. N. Shvajczer, Izv. Vuzov Fizika **51** (11), 114 (2008).
13. E. Kh. Baksht, M. V. Erofeev, V. F. Tarasenko, and V. I. Oleshko, *Spectral and amplitude-time characteristics of Cherenkov radiation at electron energies in the hundreds of keV: monograph* (STT, Tomsk, 2020).
14. N. L. Aulker and E. A. Vinnikova, Vestnik KemGU, Khimiya, No. 2, 214 (2008).
15. G. R. Ramazanova, D. V. Ananchenko, S. V. Nikiforov, M. F. Gerasimov, A. V. Ishhenko, A. K. Daultbekova, Zh. T. Karipbaev, G. A. Akhmedova-Abdik, and M. V. Zdorovecz, Optika i spektroskopiya **129** (8), 1010 (2021).
16. S. W. MeKeever, *Thermoluminescence of solids* (Cambridge University Press, 1988).
17. K. Kao and V. Khuang, *Perenos elektronov v tverdykh telakh* (Mir, Moscow, 1984).
18. P. Pokorny and A. Ibarra, J. Appl. Phys. **75** (2), 1088 (1994).
19. N. L. Aluker, A. S. Artamonov, T. I. Gimadova, and A. S. Zverev, Pribory i tekhnika eksperimenta, No. 6, 75 (2021).