

Influence of vacuum annealing on electrical properties of vanadium oxide thin films deposited by reactive DC magnetron sputtering

A. A. Baranov, M. S. Tretyakova, S. A. Zhukova, and V. E. Turkov

FSUE "TsNIIKhM"
16a Nagatinskaya st., Moscow, 115487, Russia
E-mail: alexsoft17@mail.ru

Received July 28, 2016

Consideration is given to results of the investigation of the influence of vacuum annealing on structure, phase composition and electrical properties of vanadium oxide thin films deposited by reactive DC magnetron sputtering. Structural properties of VO_x thin films has been investigated by Grazing incidence X-ray diffraction (GIXRD). The transmission line method was used to determine sheet resistance, contact resistance and TCR of the thin films. GIXRD test indicates that room temperature deposited films are amorphous. It was found that sheet resistance and TCR of the thin films decrease with increasing annealing temperature due to the reduction of the oxygen content in films during the annealing process. The vacuum annealing at 300 °C and 400 °C induces formation of VO_2 and V_4O_7 , respectively.

PACS: 68.55.-a, 07.57.Kp, 81.15.Cd

Keywords: uncooled, microbolometer, vanadium oxide, reactive DC magnetron sputtering, transmission line method, vacuum annealing.

REFERENCES

1. A. Rogalski, *Infrared Physics & Technology* **54**, 136 (2011).
2. S. A. Zhukova, D. Yu. Obizhaev, V. E. Turkov, D. D. Riskin, P. N. Kudryavcev, and Yu. S. Chetverov, *Nano- i Mikr. Tekh.* **166**, 41 (2014).
3. V. Sh. Aliev, M. A. Dem'yanenko, D. G. Esaev, I. V. Marchishin, V. N. Ovsyuk, B. I. Fomin. *Usp. Prikl. Fiz.* **1**, 471 (2013).
4. Youn-Bae Kang, *Journal of the European Ceramic Society.* **3**, 3187 (2012).
5. A. Chandrasekaran Venkatasubramanian, Orlando M. Cabarcos, David L. Allara, Mark W. Horn and S. Ashok. *J. Vac. Sci. Technol.* **27**, 956 (2009).
6. Yu. Golovinskyi, I. Khatsevych, A. Kuchuk, V. Kladko, V. Melnik, P. Lytvyn, V. Nikirin, and B. Romanyuk. *Thin Solid Films.* **564**, 179 (2014).
7. Ramis Mustafa Öksüzoğlu, Pınar Bilgiç, Mustafa Yıldırım, and Okan Deniz *Optics & Laser Technology* **48**, 102 (2013).
8. L. Wang, M. C. Li and L. C. Zhao. *Surface Review and Letters* **15**, 59 (2008).
9. Sami Franssila, *Introduction to Microfabrication* (Wiley, Singapore, 2010).
10. D. K. Schroter, *Semiconductor Material and Device Characterization* (Wiley-IEEE Press, New Jersey, 2006).