Springer Link Search Log in

Published: May 2004

Structure and Electrochemical Behavior of Lithium-Manganese Spinels Doped with Chromium and Nickel

T. L. Kulova, E. I. Karseeva, A. M. Skundin, E. I. Kachibaya, R. A. Imnadze & T. V. Paikidze

Russian Journal of Electrochemistry **40**, 494–499 (2004)

59 Accesses | **2** Citations | Metrics

Abstract

A series of compounds with the general formula $LiMn_{2-x-y}Cr_xNi_yO_4$, where $x + y = 0.05$, 0.5, or 1.0, is synthesized. It is shown that all these compounds are pure-phase spinels with parameter *a*equal to 0.8193-0.8236 nm. Doping a stoichiometric lithium-manganese spinel simultaneously with chromium and nickel makes the spinel structure stable. The initial specific capacity of a spinel depends on its doping degree. Doping $LiMn_2O_4$ with chromium and nickel simultaneously at an Mn : Cr : Ni ratio of 195 : 3 : 2 raises the spinel's specific capacity and reduces the cycling degradation. The change in the discharge capacity of $LiMn_{1.95}Cr_{0.03}Ni_{0.02}O_4$ electrodes cycled at 20, 0, and -14°C is determined.

This is a preview of subscription content, access via your institution.

Access options

Buy article PDF

39,95 €

Price includes VAT (Georgia)

Instant access to the full article PDF.

Rent this article via DeepDyve.

Learn more about Institutional subscriptions

REFERENCES

1. Reimers, J.N., Fuller, E.W., Rossen, E., and Dahn, J.R., *J. Electrochem. Soc.*, 1993, vol. 140, p. 3396.

2. Gummow, R.J. and Thackeray, M.M., *J. Electrochem. Soc.*, 1994, vol. 141, p. 1178.

3. Pistoia, G., Antonini, A., and Zane, D., *Solid State Ionics*, 1995, vol. 78, p. 115.

4. Amatucci, G.G., Schmutz, C.N., Blyr, A., Sigala, C., Gozdz, A.S., Larcher, D., and Tarascon, J.M., *J. Power Sources*, 1997, vol. 69, p. 11.

5. Yamada, A., Miura, K., Hinokuma, K., and Tanaka, M., *J. Electrochem. Soc.*, 1995, vol. 142, p. 2149.

6. Yoshio, M., Xia, Y., Kumada, N., and Ma, Sh., *J. Power Sources*, 2001, vol. 101, p. 79.

7. Gummow, R.J., De Kock, A., and Thackeray, M.M., *Solid State Ionics*, 1994, vol. 69, p. 59.

8. Thackeray, M.M., Shao-Horn, Y., Kahaian, A.J., Kepler, K.D., Skinner, E., Vaughey, J.T., and Hackney, S.A., *Electrochem. Solid State Lett.*, 1998, vol. 1, p. 7.

9. Antonini, A., Bellito, C., Pasquali, M., and Pistoia, G., *J. Electrochem. Soc.*, 1998, vol. 145, p. 2726.

10. Bonino, F., Panero, S., Satolli, D., and Scrosati, B., *J. Power Sources*, 2001, vol. 97-98, p. 389.

11. Hong, K.-J. and Sun, Y.-K., *J. Power Sources*, 2002, vol. 109, p. 427.

12. Lee, Y.-S., Kumada, N., and Yoshio, M., *J. Power Sources*, 2001, vol. 96, p. 376.

13. Amarilla, J.M., Martin de Vidales, J.L., and Rojas, R.M., *Solid State Ionics*, 2002, vol. 127, p. 73.

14. Hayashi, N., Ikuta, H., and Wakihara, M., *J. Electrochem. Soc.*, 1999, vol. 146, p. 1351.

15. Baochen, W., Yongyao, X., Li, F., and Dongjiang, Zh., *J. Power Sources*, 1993, vol. 43-44, p. 539.

16. Amine, K., Tukamoto, H., Yasuda, H., and Fujita, Y., *J. Electrochem. Soc.*, 1996, vol. 143, p. 1607.

17. Zhong, Q., Bonakdarpour, A., Zhang, M., Gao, Y., and Dahn, J.R., *J. Electrochem. Soc.*, 1997, vol. 144, p. 205.

18. Ohzuku, T., Takeda, S., and Iwanaga, M., *J. Power Sources*, 1999, vol. 81, p. 90.

19. Kulova, T.L., Kanevskii, L.S., Skundin, A.M., Kachibaya, E.I., Imnadze, R.A., and Paikidze, T.V., *Elektrokhimiya*, 1999, vol. 35, p. 1002.

20. Karseeva, E.I., Kulova, T.L., Skundin, A.M., Kachibaya, E.I., Imnadze, R.A., and Paikidze, T.V., *Elektrokhim. Energ.*, 2002, vol. 2, p. 12.

21. Zhang, S.S., Xu, K., Allen, J.L., and Jow, T.R., *J. Power Sources*, 2002, vol. 110, p. 216.

22. Plichta, E.J. and Behl, W.K., *J. Power Sources*, 2000, vol. 88, p. 192.

23. Plichta, E.J., Hendrickson, M., Thompson, R., Au, G., Behl, W.K., Smart, M.C., Ratnakumar, B.V., and Surampud, S., *J. Power Sources*, 2001, vol. 94, p. 160.

24. Herreyre, S., Huchet, O., Barusseau, S., Penrton, F., Bodet, J.M., and Biensan, Ph., *J. Power Sources*, 2001, vol. 97-98, p. 576.

25. Kachibaia, E., Japaridze, L., Akhvlediani, R., Japaridze, Sh., Imnadze, R., and Paikidze, T., *Bull. Georg. Acad. Sci.*, 1998, vol. 157, p. 428.

26. *X-Ray Diffraction Data Cards, ASTM, 18-736*, 1977.

27. Dean, J.A., *Lange's Handbook of Chemistry*, New York: McGraw-Hill, 1992, 4th ed., p. 4.

Author information

Authors and Affiliations

Frumkin Institute of Electrochemistry, Russian Academy of Sciences, Leninskii pr. 31, Moscow, 119071, Russia

T. L. Kulova, E. I. Karseeva & A. M. Skundin

Agladze Institute of Inorganic Chemistry and Electrochemistry of Academy of Sciences of Georgia, GAS, ul. Jikiya 7, Tbilisi, 380086, Georgia

E. I. Kachibaya, R. A. Imnadze & T. V. Paikidze

Rights and permissions

Reprints and Permissions

About this article

Cite this article

Kulova, T.L., Karseeva, E.I., Skundin, A.M. *et al.* Structure and Electrochemical Behavior of Lithium-Manganese Spinels Doped with Chromium and Nickel. *Russian Journal of Electrochemistry* **40**, 494–499 (2004). https://doi.org/10.1023/B:RUEL.0000027619.08736.93

Issue Date

May 2004

DOI

https://doi.org/10.1023/B:RUEL.0000027619.08736.93

lithium-ion batteries

lithium-manganese spinels **discharge capacity**

cycling

Not logged in - 5.178.173.177
Not affiliated
SPRINGER NATURE

© 2023 Springer Nature Switzerland AG. Part of Springer Nature.