

论文

气氛对MnCr<sub>2</sub>O<sub>4</sub>尖晶石纳米线生长的影响

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摘要:

建立了一种在氮气和氢气的还原性混合气氛和1100 °C条件下加热商业不锈钢箔(304)制备MnCr<sub>2</sub>O<sub>4</sub>尖晶石纳米线的简单方法, 并研究了不同气氛对纳米线生长的影响. 研究发现, 混合气体中氢气含量的变化会影响纳米线的形貌和产率; 而氧化性气氛(如空气)下则得不到纳米线. 在还原性气氛下, Mn和Cr原子可以和反应室内残留的痕量氧反应生成MnCr<sub>2</sub>O<sub>4</sub>尖晶石, 而Fe和Ni原子不能被氧化, 但是Fe和Ni可以起到催化纳米线生长的作用, 纳米线的生长机理属于自催化性的气-液-固(VLS)机制.

关键词: MnCr<sub>2</sub>O<sub>4</sub>纳米线 不锈钢箔 气氛 气-液-固生长机制

Effect of Atmosphere on the Growth of MnCr<sub>2</sub>O<sub>4</sub> Spinel Nanowires

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Abstract:

MnCr<sub>2</sub>O<sub>4</sub> spinel single-crystalline nanowires were synthesized by heating commercial stainless steel foil under a reducing atmosphere. The hydrogen content in the atmosphere has important influence on the yield and morphology of the grown nanowires. It was found that the reducing atmosphere plays a key role in the nanowire growth. In the reducing atmosphere, the Mn and Cr elements in the stainless steel could be selectively oxidized because of their higher affinity for oxygen than the Fe and Ni elements. The Fe and Ni elements in the stainless steel, however, acted as the catalyst for the vapor-liquid-solid (VLS) growth of the MnCr<sub>2</sub>O<sub>4</sub> nanowires.

Keywords: MnCr<sub>2</sub>O<sub>4</sub> nanowire Stainless steel foil Atmosphere VLS growth mechanism

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#### 参考文献:

1. Cui Y., Wei Q. Q., Park H. K., et al.. Science[J], 2001, 293: 1289—1292
2. Favier F., Walter E. C., Zach M. P., et al.. Science[J], 2001, 293: 2227—2231
3. Krupika S., Novak P.; Ed.: Wohlfarth E. P.. Ferromagnetic Materials[M], Amsterdam: North-Holland Publishing Company, 1982, 3: 189—304
4. Lüders U., Bibes M., Bouzeshouane K., et al.. J. Appl. Phys.[J], 2006, 99: 08K301-1—3
5. LIU Xing-Quan(刘兴泉), CHEN Zhao-Yong(陈召勇), LI Shu-Hua(李淑华), et al.. Chem. J. Chinese Universities(高等学校化学学报)[J], 2002, 23(2): 179—181
6. TONG Qing-Song(童庆松), LIU Han-San(刘汉三), LIN Su-Ying(林素英), et al.. Chem. J. Chinese Universities(高等学校化学学报)[J], 2005, 26(1): 138—141
7. FENG Ji-Jun(冯季军), XU Rong-Qi(徐荣琪), TANG Zhi-Yuan(唐致远), et al.. Chem. J. Chinese Universities(高等学校化学学报)[J], 2007, 28(8): 1532—1536
8. Fava F. F., Baraille I., Lichanot A., et al.. J. Phys: Condens. Matter.[J], 1997, 9: 10715—10724
9. Bhowmik R. N., Ranganathan R., Nagarajan R.. Phys. Rev. B[J], 2006, 73: 144413-1—9
10. Lu Z. G., Zhu J. H., Payzant E. A., et al.. J. Am. Ceram. Soc.[J], 2005, 88: 1050—1053
11. Zhu W. Z., Deevi S. C.. Mater. Sci. Eng. A[J], 2003, 348: 227—243
12. HAN Bing(韩冰), YANG Gui-Qin(杨桂琴), YAN Le-Mei(严乐美), et al.. Chem. Indust. Engin.(化学工艺与工程)[J], 2002, 19(6): 448—452
13. Chen X. H., Zhang H. T., Wang C. H., et al.. Appl. Phys. Lett.[J], 2002, 81: 4419—4423
14. Kahn M. L., Zhang Z. J.. Appl. Phys. Lett.[J], 1999, 78: 3651—3653
15. QI Xing(祁欣), CHEN Xiu-Xia(陈秀霞), ZHOU Xiao-Duo(周小多), et al.. J. Magn. Mater. Devices(磁性材料及器件)[J], 2008, 39(1): 18—27
16. Chu X. F., Liu X. Q., Meng G. Y.. Sens. Actuators B[J], 1999, 55: 19—22
17. Wu X. C., Tao Y. R., Han Z. J., et al.. J. Mater. Chem.[J], 2003, 13: 2649—2651
18. Na C. W., Han D. S., Park J. H., et al.. Chem. Commun.[J], 2006: 2251—2253
19. Zeng D. W., Xie C. S., Dong M., et al.. Appl. Phys. A: Mater. Sci. Process[J], 2004, 79: 1865—1868
20. Chen Y. J., Liu Z. W., Ringer S. P., et al.. Crystal Growth & Design[J], 2007, 7(11): 2279—2281
21. Evans C. C.. Whiskers[M], London: Mills and Boon Limited, 1972
22. Levitt A. P.. Whisker Technology[M], New York: John Wiley & Sons, Inc. 1970
23. Lochner H.. Developments in the Annealing of Sheet Steels[C], Warrendale, 1991: 426—429
24. Wilson P. R., Chen Z.. Scr. Mater.[J], 2005, 53: 119—123
25. Saeki I., Saito T., Furuichi R., et al.. Corros. Sci.[J], 1998, 40: 1295—1302
26. Olefjord I., Leijon W., Jelvestam U.. Appl. Surf. Sci.[J], 1980, 6: 241—255

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