Document details

Back to results | 1 of 1

Ceramics International
Volume 44, Issue 1, January 2018, Pages 317-325

Optimizing the processing conditions of sodium potassium niobate thin films prepared by sol-gel spin coating technique (Article)

Akmal, M.H.M.[ac], Warikh, A.R.M.[a], Azlan, U.A.A.[b], Azmi, N.A.[a], Salleh, M.S.[a], Kasim, M.S.[a]

[a]Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka (UTeM), Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia
[b]Faculty of Engineering Technology, Universiti Teknikal Malaysia Melaka (UTeM), Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia
[c]Faculty of Engineering, International Islamic University Malaysia (IIUM), Jalan Gombak, Kuala Lumpur, Malaysia

Abstract

View references (26)

In the present study, potassium sodium niobate (KNN) thin films were synthesized by means of sol-gel spin coating method. Along with the synthesis, the effects of annealing temperature and various number of coating layers on both the structural and electrical properties were looked into. The results of the study revealed that the annealing temperature had a great impact on the properties of KNN. In addition, the XRD diffractograms and texture coefficient of the synthesized films confirmed that a highly oriented orthorhombic perovskite structure was obtained at 650 °C, whereas at a relatively higher temperature (700 °C), a spurious phase of $K_4Nb_6O_{17}$ was evolved. In addition, the growth of KNN at 650 °C exhibited a reasonable resistivity value for piezoelectric applications. Looking into the results, it was discovered that the KNN thin films also found to be dependent on a number of coating layers. Field emission scanning electron microscopy (FESEM) showed that KNN with five coating layers was highly crystalline, cracks-free, and had significantly more homogenous surface morphology and the size of grains being uniform, the resistivity of KNN thin films improved with the increasing number of coating layers i.e., up to five. © 2017 Elsevier Ltd and Techna Group S.r.l.

Reaxys Database Information

View Compounds

Author keywords

Annealing | Coating layer | KNN | Sol-gel spin coating

Indexed keywords

Engineering controlled terms: Annealing | Coatings | Field emission microscopes | Nanofiltration membranes | Niobium compounds | Potassium | Scanning electron microscopy | Sodium | Sol-gel process | Sol-gels | Spin coating

Compendex keywords: Coating layer | Field emission scanning electron microscopy | Orthorhombic perovskite | Potassium sodium niobate | Sodium potassium niobate | Sol-gel spin coating | Sol-gel spin coating method | Structural and electrical properties

Engineering main heading: Thin films

Funding details

Funding number	Funding sponsor	Acronym	Funding opportunities
	Universiti Teknikal Malaysia Melaka	UTeM	See opportunities by UTeM ↗
FRGS/1/2014/ TK04/FTK/02/F00207	Ministry of Higher Education, Malaysia	MOHE	See opportunities by MOHE ↗

Funding text

The authors would like to gratefully acknowledge the assistance and funding made available by the Universiti Teknikal Malaysia Melaka (UTeM) and the Ministry of Higher Education, Malaysia under the Fundamental Research Grant Scheme (FRGS), grant no.: FRGS/1/2014/ TK04/FTK/02/F00207 .

ISSN: 02728842
CODEN: CINND
Source Type: Journal
Original language: English
DOI: 10.1016/j.ceramint.2017.09.175
Document Type: Article
Publisher: Elsevier Ltd

Influence of yttrium dopant on the structure and electrical conductivity of potassium sodium niobate thin films

Hatta, M.A.M. , Abd Rashid, M.W. , Azlan, U.A.-A.H.
(2016) Materials Research

View all related documents based on references

Find more related documents in Scopus based on:

Authors > Keywords >

References (26)

View in search results format >

All | Export | Print | E-mail | Save to PDF | Create bibliography

1 Matsubara, M., Yamaguchi, T., Kikuta, K., Hirano, S.-I.
Sinterability and piezoelectric properties of $(K,Na)NbO_3$ ceramics with novel sintering aid

(2004) *Japanese Journal of Applied Physics, Part 1: Regular Papers and Short Notes and Review Papers*, 43 (10), pp. 7159-7163. Cited 184 times.
doi: 10.1143/JJAP.43.7159

View at Publisher

2 Rani, R.
Influence of sintering temperature on densification, structure and microstructure of Li and Sb co-modified $(K,Na)NbO_3$-based ceramics
(2011) *Mater. Sci. Appl.*, 2, pp. 1416-1420. Cited 4 times.

3 Fasquelle, D., Mascot, M., Sama, N., Remiens, D., Carru, J.-C.
Lead-free piezoelectric thin films for RoHS devices

(2015) *Sensors and Actuators, A: Physical*, 229, art. no. 9065, pp. 30-35. Cited 6 times.
doi: 10.1016/j.sna.2015.02.009

View at Publisher

4 Kang, C., Park, J.-H., Shen, D., Ahn, H., Park, M., Kim, D.-J.
Growth and characterization of $(K_{0.5}\ Na_{0.5})NbO_3$ thin films by a sol-gel method

(2011) *Journal of Sol-Gel Science and Technology*, 58 (1), pp. 85-90. Cited 18 times.
doi: 10.1007/s10971-010-2359-6

View at Publisher

5 Yu, G., Zhang, H., Zhang, B.-P., Zhang, J.
Cu-particle-dispersed $(K_{0.5}Na_{0.5})NbO_3$ composite thin films derived from sol-gel processing

(2012) *Journal of Sol-Gel Science and Technology*, 61 (2), pp. 403-410. Cited 4 times.
doi: 10.1007/s10971-011-2640-3

View at Publisher

6 Ahn, C.W., Hwang, H.-I., Lee, K.S., Jin, B.M., Park, S., Park, G., Yoon, D., (...), Kim, I.W.

Raman spectra study of $K_{0.5}Na_{0.5}NbO_3$ ferroelectric thin films

(2010) *Japanese Journal of Applied Physics*, 49 (9 PART 1), art. no. 095801. Cited 25 times.
http://jjap.jsap.jp/link?JJAP/49/095801/pdf
doi: 10.1143/JJAP.49.095801

View at Publisher

7 Harttar, M.A.M., Rashid, M.W.A., Azlan, U.A.A.

Physical and electrical properties enhancement of rare-earth doped-potassium sodium niobate (KNN): A review

(2015) *Ceramics - Silikaty*, 59 (2), pp. 158-163. Cited 6 times.
http://www.ceramics-silikaty.cz/2015/pdf/2015_02_158.pdf

8 Maziati Akmal, M.H., Warikh, A.R.M., Azlan, U.A.A., Azam, M.A., Ismail, S.

Effect of amphoteric dopant on the dielectric and structural properties of yttrium doped potassium sodium niobate thin film

(2016) *Materials Letters*, 170, pp. 10-14. Cited 3 times.
http://www.journals.elsevier.com/materials-letters/
doi: 10.1016/j.matlet.2016.01.135

View at Publisher

9 Wang, L., Ren, W., Shi, P., Wu, X.

Cobalt doping effects on structures and electrical properties of lead-free ferroelectric $K_{0.5}Na_{0.5}NbO_3$ films

(2014) *Journal of Alloys and Compounds*, 608, pp. 202-206. Cited 8 times.
doi: 10.1016/j.jallcom.2014.04.118

View at Publisher

10 Maziati Akmal, M.H., Warikh, A.R.M., Azlan, U.A.A., Azmi, N.A.

The effects of different annealing temperatures and number of deposition layers on the crystallographic properties sodium niobate (KNN) thin films synthesized by sol-gel spin coating technique

(2017) *Journal of Advanced Manufacturing Technology*, 11 (1), art. no. 4.
http://journal.utem.edu.my/index.php/jamt/article/download/1232/1310

11 Wang, L., Zuo, R., Liu, L., Su, H., Shi, M., Chu, X., Wang, X., (...), Li, L.

Preparation and characterization of sol-gel derived (Li,Ta,Sb) modified (K,Na)NbO3 lead-free ferroelectric thin films

(2011) *Materials Chemistry and Physics*, 130 (1-2), pp. 165-169. Cited 10 times.
doi: 10.1016/j.matchemphys.2011.06.022

View at Publisher

12 Vendrell, X., García, J.E., Bril, X., Ochoa, D.A., Mestres, L., Dezanneau, G.

Improving the functional properties of $(K_{0.5}Na_{0.5})NbO_3$ piezoceramics by acceptor doping

(2015) *Journal of the European Ceramic Society*, 35 (1), pp. 125-130. Cited 22 times.
http://www.journals.elsevier.com/journal-of-the-european-ceramic-society/
doi: 10.1016/j.jeurceramsoc.2014.08.033

View at Publisher

13 Vendrell, X., Raymond, O., Ochoa, D.A., García, J.E., Mestres, L.

Growth and physical properties of highly oriented La-doped $(K,Na)NbO_3$ ferroelectric thin films

(2015) *Thin Solid Films*, 577, pp. 35-41. Cited 8 times.
http://www.journals.elsevier.com/journal-of-the-energy-institute
doi: 10.1016/j.tsf.2015.01.038

View at Publisher

14 Zhengfa, L., Yongxiang, L., Jiwei, Z.
Grain growth and piezoelectric property of KNN-based lead-free ceramics

(2011) *Current Applied Physics*, 11 (3 SUPPL.), pp. S2-S13. Cited 18 times.
doi: 10.1016/j.cap.2011.04.014

View at Publisher

15 Dolhen, M., Mahajan, A., Pinho, R., Costa, M.E., Trolliard, G., Vilarinho, P.M.
Sodium potassium niobate ($K_{0.5}Na_{0.5}NbO_3$, KNN) thick films by electrophoretic deposition

(2015) *RSC Advances*, 5 (6), pp. 4698-4706. Cited 17 times.
http://pubs.rsc.org/en/journals/journalissues
doi: 10.1039/c4ra11058g

View at Publisher

16 Khorrami, G.H., Kompany, A., Khorsand Zak, A.
Structural and optical properties of (K,Na)NbO_3 nanoparticles synthesized by a modified sol-gel method using starch media

(2015) *Advanced Powder Technology*, 26 (1), pp. 113-118. Cited 12 times.
http://www.elsevier.com
doi: 10.1016/j.apt.2014.08.013

View at Publisher

17 Wang, L., Ren, W., Shi, P., Wu, X., Yao, X.
Effects of thickness on structures and electrical properties of Mn-doped $K_{0.5}Na_{0.5}NbO_3$ films

(2014) *Journal of Alloys and Compounds*, 582, pp. 759-763. Cited 4 times.
doi: 10.1016/j.jallcom.2013.08.094

View at Publisher

18 Tanaka, K., Kakimoto, K.-i., Ohsato, H.
Fabrication of highly oriented lead-free (Na, K)NbO_3 thin films at low temperature by Sol-Gel process

(2006) *Journal of Crystal Growth*, 294 (2), pp. 209-213. Cited 64 times.
doi: 10.1016/j.jcrysgro.2006.05.041

View at Publisher

19 Bindu, P.
Thomas, estimation of lattice strain in ZnO nanoparticles: x-ray peak profile analysis
(2014) *J. Theor. Appl. Phys.*, 8.

20 Bruncková, H., Medvecký, L., Hvizdoš, P., Щurišin, J.
Structural and nanomechanical properties of sol-gel prepared (K, Na)NbO_3 thin films

(2015) *Surface and Interface Analysis*, 47 (11), pp. 1063-1071. Cited 2 times.
http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1096-9918
doi: 10.1002/sia.5846

View at Publisher

21 Kim, D.H., Cho, N.G., Park, H., Kim, H.G.
Structural and electrical properties of high temperature deposited epitaxial ZnO thin film fabricated by RF magnetron sputtering

(2007) *Integrated Ferroelectrics*, 95 (1), pp. 35-43. Cited 3 times.
doi: 10.1080/10584580701756060

View at Publisher

22 Chen, Y.L., Yang, S.F.

PTCR effect in donor doped barium titanate: Review of compositions, microstructures, processing and properties

(2011) *Advances in Applied Ceramics*, 110 (5), pp. 257-269. Cited 35 times.
http://docserver.ingentaconnect.com/deliver/connect/maney/17436753/v110n5/s1.pdf?expires=1310110749&id=63481649&titleid=11130&accname=Elsevier+Science&checksum=4CDBDF413222A6BDDA23B3A6D611CF67
doi: 10.1179/1743676111Y.0000000001

View at Publisher

23 Safari, A., Abazari, M.

Lead-free piezoelectric ceramics and thin films

(2010) *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, 57 (10), art. no. 5587395, pp. 2165-2176. Cited 47 times.
doi: 10.1109/TUFFC.2010.1674

View at Publisher

24 Thouless, M.D.

Modeling the development and relaxation of stresses in films

(1995) *Annual Review of Materials Science*, 25 (1), pp. 69-96. Cited 67 times.
doi: 10.1146/annurev.ms.25.080195.000441

View at Publisher

25 Prosser, J.H., Brugarolas, T., Lee, S., Nolte, A.J., Lee, D.

Avoiding cracks in nanoparticle films

(2012) *Nano Letters*, 12 (10), pp. 5287-5291. Cited 60 times.
doi: 10.1021/nl302555k

View at Publisher

26 Lacy, F.

Developing a theoretical relationship between electrical resistivity, temperature, and film thickness for conductors

(2011) *Nanoscale Research Letters*, 6, art. no. 636, pp. 1-26. Cited 42 times.
doi: 10.1186/1556-276X-6-636

View at Publisher

Warikh, A.R.M.; Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka (UTeM), Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia; email:warikh@utem.edu.my