Substructure properties of MgO thin films obtained by spray-pyrolysis technique

Diachenko O.V., Opanasyuk A.S., Kurbatov D.I.

Sumy State University, Sumy, Ukraine

Today more and more areas of electronic equipment used oxide materials as a result - their study is very relevant. Therefore, in this paper the substructure properties of magnesium oxide thin films have been studied.

Magnesium oxide films were obtained on glass substrates 1x1 cm^2 by spray pyrolysis technique. Before deposition the substrates surface were cleaned in the tub with ethanol for 300 seconds. We used the 0.2 M magnesium chloride hexahydrate ($MgCl_2$□$6H_2O$) aqueous solution as a precursor solution. Deposition of MgO films was carried out at the substrate temperature range from T_s = 640 K to 690 K with step □10 K.

The diffractometrical method was used for estimation of average values of the coherent scattering domain size (CSD) L and microstrain (ε) by the half-width of the diffraction lines. To separate the diffraction broadening caused by physical and instrumental effects we used approximations of the X-ray line by Cauchy and Gauss functions. Additionally, microstrain and the size of CSD were determined by the method of approximation of the X-ray line as a threefold convolution.

The results of calculations of CSD and microstrain in crystallographic directions are summarized in Table. As it is shown in Table, the values of substructural parameters, obtained with the help of different approximations, correlate well with each other, as it should be on theoretical considerations. This demonstrates the reliability of the results. However, the most accurate values were obtained by threefold convolution of the functions.

Substructural features of MgO films obtained using different approximations

T, K	(*hkl*)	*L*, nm			□□ 10^3		
		Approximations		From convolution	Approximations		From convolution
		Gauss	Cauchy		Gauss	Cauchy	
370	(111)-(222)	37.7	63.1	42,8	3.17	2.35	2.75
380	(111)-(222)	100.1	491.5	255.9	4.37	4.04	4.29
390	(111)-(222)	16.1	17.8	16.2	2.56	0.91	1.91
400	(111)-(222)	27.2	41.4	29.6	3.77	2.67	3.19
410	(111)-(222)	32.5	65.2	40.7	4.82	3.99	4.35
420	(111)-(222)	32.5	65.2	40.7	4.82	3.99	4.35