OGÓLNOPOLSKA KONFERENCJA NAUKOWA "INŻYNIERIA POWIERZCHNI' 95", Radom, Poland 14-15/12.1995

W. Rosiński, J. Jagielski, G. Gawlik

Institute of Electronic Materials Technology
ul. Wólczyńska 133, 01-919 Warszawa, Poland

ZASTOSOWANIE IMPLANTACJI DO MODYFIKACJI WŁASNOŚCI TECHNICZNEJ WARSTWY WIERZCHNIEJ METALI

Przedstawiono wyniki badań poświęconych migracji domieszek implantowanych do żelaza, przemian fazowych w żelazie domieszkowanym Cr, Al, Mn i Ti, a następnie implantowanym azotem, jak również wyniki testów zużyciowych i korozyjnych stali implantowanej różnymi domieszkami.

Prezentowano zwięzłe streszczenie wyników uzyskanych w trakcie realizacji grantu KBN pod tytułem "Zastosowanie implantacji do modyfikacij własności technicznej warstwy wierzchniej metali" wykonywanej w ITME w latach 1992-1994. Podstawowym celem grantu było zbadanie procesów zachodzących podczas implantacji jonów do metali, szczególnie wyjaśnienie problemów związanych z przemysłową aplikacją tej technologii. Do takich problemów należą przede wszystkim zjawiska migracji domieszki podczas procesów prowadzonych w podwyższonej temperaturze. Dlatego też znaczną część stanowiło badanie migracji azotu implantowanego do żelaza w zakresie temperatur osiąganych w implantatorach przemysłowych. Kolejnym zagadnieniem analizowanym w ramach opisywanych prac było zbadanie wpływu domieszek stopowych na przemiany fazowe w implantowanym układzie żelazo-azot. W tym przypadku celem było zbliżenie się do zrozumienia przemian fazowych zachodzących podczas implantacji azotu do stali stosowanych w przemyśle. Z uwagi na znaczną komplikację struktury materiałów stosowanych przemysłowo zdecydowano na zbadanie przemian fazowych w układzie modelowym. Pierwszym etapem było opracowanie "diagramu fazowego" dla implantowanego układu żelazo-azot. Drugim, przedstawianym w niniejszej pracy, było zbadanie zmian wywołanych przez obecność wybranych domieszek stopowych na przemiany fazowe w tym układzie. Pozwoliło to na wyizolowanie wpływu konkretnej domieszki na stabilność faz azotkowych. Ostatnim wreszcie kompleksem badań było zbadanie wpływu implantacji wielokrotnej różnymi kombinacjami domieszek na własności użytkowe wybranych stali. Badane były tu odporność na ścieranie i odporność korozyjna.

Materiał prezentowano na sesji komunikatów.
Tekst wydrukowano w materiałach z konferencji.

EFTF'96 - 10th EUROPEAN FREQUENCY AND TIME FORUM Brighton, United Kingdom, 5-7/03.1996

P. Nagłowski, H. Majewska

Institute of Electronic Materials Technology
ul. Wólczyńska 133, 01-919 Warszawa, Poland

PARASITIC BULK WAVES IN WIDE BAND SAW FILTERS DESIGNED ON 128° ROTATED Y-CUT OF $LiNbO_3$

Bulk wave transmission is a serious problem in SAW transversal filters. This transmission degrades filter stopband especially on the high-frequency side of the passband. One way to reduce the problem is the use of a multistrip coupler. However this solution increases the size and cost of the device. Some crystalline material cuts exist in which the bulk wave transmission is relatively small. One of these cuts is the 128° rotated Y-cut of $LiNbO_3$. Comparatively low stopband degradation caused by bulk waves was previously demonstrated for low and medium bandwidth filters using this cut as a substrate.

The purpose of this work was to investigate bulk wave transmission in wide band filters designed on 128° YX $LiNbO_3$. In this paper we present the results obtained for a 40% bandwidth in-line filter consisting of one apodized and one unapodized transducer. Bulk wave transmission in the filter was investigated in both frequency and time domain. Fourier transform and windowing techniques were used to identify the most important bulk wave modes and their contribution to the frequency response of the device. The influence of the substrate backside grooving on bulk wave propagation was examined.

Application of grooving significantly reduces the level of bulk wave modes bouncing off the backside of the substrate. As a result substantial improvement in stopband rejection is obtained (more than 20 dB at some frequencies). This improvement was observed on both sides of the passband. We found out that in the devices with their backside grooved one of the most prominent bulk waves is the longitudinal wave. This wave forms its own wide passband in the frequency range corresponding to the upper stopband of the filter. The longitudinal wave limits the rejection in the upper stopband to approximately 40 dB.

Materiał prezentowano na sesji posterów.
Tekst wydrukowano w materiałach z konferencji.

EFTF'96 - 10th EUROPEAN FREQUENCY AND TIME FORUM
Brighton, United Kingdom, 5-7/03.1996

W.Soluch

Institute of Electronic Materials Technology
ul. Wólczyńska 133, 01-919 Warszawa, Poland

SAW TWO RESONATOR FILTER USING SYNCHRONOUS COUPLING INTERDIGITAL TRANSDUCERS

SAW two resonator filter with coupling interdigital transducers (IDTs) placed inside reflectors, was designed, fabricated and tested. In the filter, electrodes of the coupling IDTs are in spatial synchronism with reflectors' electrodes. Compare to the case when the coupling IDTs are between reflectors, resonators are shorter, the unwanted longitudinal modes are suppressed and better rejection is obtained in the stopband.

The filter, fabricated on ST-cut quartz, had the following parameters: acoustic aperture - lmm, total number of each reflector strips - 600, number of electrodes of sychronous coupling IDT (unapodized, one IDT in each reflector) - 101, number of electrodes of the input and output IDTs (apodized) - 61, width of electrodes - 2.6 μm, aluminum layer thickness 0.12 μm, and lateral shift of resonators - 0.3 mm.

At the centre frequency of 302.6 MHz, the insertion loss (unmatched, in a 50 Ω measuring system) was equal to about l6dB. The minimum rejection in the stopband was higher then 40dB. Some spurious transverse mode where present near the passband. They can be eliminated by using apodized synchronous coupling IDTs.

This work was supported by the State Committee for Scientific Reserch (KBN) under grant number 8 S501 051 04.

Materiał prezentowano na sesji komunikatów.
Tekst wydrukowano w materiałach z konferencji.

X TOP'96 - 3rd EUROPEAN SYMPOSIUM ON X-RAY TOPOGRAPHY AND HIGH RESOLUTION DIFFRACTION
Palermo, Italy, 22-24/04.1996

K. Wieteska[1], W. Wierzchowski[2], W. Graeff[3]

[1] Institute of Atomic Energy, 05-400 Otwock-Świerk , Poland

[2] Institute of Electronic Materials Technology
ul. Wólczyńska 133, 01-919 Warszawa, Poland

[3] Hasylab at Desy, Notkestraße 85, D-22603 Hamburg, Germany

INTERFERENCE EFFECTS IN BRAGG-CASE SYNCHROTRON SECTION TOPOGRAPHY OF ELASTICALLY BENT SILICON IMPLANTED CRYSTALS

The white beam synchrotron section topography was applied to 4.8 MeV α–particles silicon crystal elastically bent with the radius of curvature close to 100 m. A number of section patterns corresponding to different zero-layer and skew reflections was analysed. It was found that the section pattern in the bent sample was drastically different from those observed in flat sample which were discussed in [1]. The difference consist in the occurrence of the sets of additional interference fringes covering long distance up to several millimeters behind the main diffraction maximum.

It was possible to reproduce the character of the fringes both in the implanted and non implanted region by numerical integration of the Takagi-Taupin equation. The present interference effects were also studied by visualization of intensity distribution in the plane of diffraction.

[1] K. Wieteska, W. Wierzchowski, W. Graeff: paper submitted to J. *Appl.* Cryst..

Materiał prezentowano na sesji posterów.
Tekst wydrukowano w materiałach z konferencji.

X TOP'96 - 3rd EUROPEAN SYMPOSIUM ON X-RAY TOPOGRAPHY AND HIGH RESOLUTION DIFFRACTION
Palermo, Italy, 22-24/04.1996

W. Wierzchowski[1)], K. Wieteska [2)], W. Graeff[3)]

[1)] Institute of Electronic Materials Technology
ul. Wólczyńska 133, 01-919 Warszawa, Poland

[2)] Institute of Atomic Energy, 05-400 Otwock-Świerk, Poland

[3)] Hasylab at Desy, Notkestraße 85, D-22603 Hamburg, Germany

THE IMAGES OF MISFIT DISLOCATIONS IN BRAGG-CASE SYNCHROTRON SECTION TOPOGRAPHY

The silicon epitaxial layers with a misfit factor $5x10^{-5}$ caused by doping of the substrate with boron were studied by means of back-reflection synchrotron section topography. The synchrotron experiments were realized using white radiation beam limited by 5 μm wide slit. The presently examined samples with the thickness 10 - 20 μm contained usually certain amount of misfit dislocation.

It was found that when the curvature of the sample was negligible the section pattern contained of two fringes corresponding respectively to the reflection from the surface of the layer and to the surface of the substrate. In this case the misfit dislocations were revealed in the direct contrast most intense in the vicinity of the fringe due to the reflection from the substrate.

The observed pattern became significantly different when the sample had a certain curvature. In this case additional interference fringes were observed in wide area behind the main two fringes. The sequence of these interference fringes was dependent on the curvature of the sample and the reflection. It was also considerably different from that of bent substrate wafers with the similar curvature. As a consequence the images of misfit dislocations in the bent epitaxial layers also significantly changed. They became much more extended and contained many characteristic details.

The contrast of interference fringes in epitaxial layer and of misfit dislocations was reproduced with a reasonable accuracy both in the case of flat and bent crystals using numerical integration of the Takagi-Taupin equations. The present results confirmed former identification of misflt dislocations type as mixed 60°, obtained using numerical simulation of the double-crystal images.

Materiał prezentowano na sesji posterów.
Tekst wydrukowano w materiałach z konferencji.

IEEE SIMC'9 - 9th CONFERENCE ON SEMICONDUCTING AND INSULATING MATERIALS, Toulouse, France, 29/04-3/05.1996

P. Kamiński [1], M Pawłowski [2], R. Ćwirko [2], M Palczewska [1], R. Kozłowski [1]

[1] Institute of Electronic Materials Technology
ul. Wólczyńska 133, 01-919 Warszawa, Poland

[2] Military University of Technology
ul. Kaliskiego 2, 01-489, Warszawa, Poland

CHARACTERISATION OF DEEP-LEVEL DEFECTS IN SEMI-INSULATING GaAs AND InP BY HIGH RESOLUTION PHOTO-INDUCED TRANSIENT SPECTROSCOPY (HRPITS)

Semi-Insulating (SI) GaAs and InP are substrate materials for manufacturing high speed electronic devices. Properties of these compounds, however, are controlled by point defects which involve strong perturbation of local lattice potential and create bound states deep in the band gap. So, monitoring of deep states in SI GaAs and InP is of great practical importance in terms of device performance, yield and reproducibility.

In this paper we report some recent results obtained by means of the digital PITS technique for as-grown SI undoped GaAs and Fe-doped InP. The photocurrent decay due to the thermal emission of trapped charge carriers is digitised, averaged, and stored in a computer for later analysis. A high resolution of the experimental system is obtained by cutting off the upper part of the decay, which is related to the excess carrier recombination, and amplifying the lower part of the decay before digitisation. The values of emission rates are received from computer ftting of several exponential terms to the photocurrent decays sampled at various temperatures. The calculations are performed by an iterative non-linear least squares method. For SI undoped GaAs, three traps Tl(0.58 eV), T2(0.66 eV) and T3(0.73 eV) attributed to the known centres EL3, HL9 and EL2, respectively, are resolved. For SI Fe-doped InP, the 0.64-eV trap related to the Fe^{2+} centre is seen. The studies are completed by the Electron Spin Resonance (ESR) measurements for the same samples. In the case of undoped SI GaAs samples, As_{Ga} as well as FRl and FR2 defects are present. For Fe-doped SI InP samples, the ESR line of Fe^{3+} centres is observed.

Materiał prezentowano na sesji posterów.
Tekst wydrukowano w materiałach z konferencji.

MIKON'96 - 11th INTERNATIONAL MICROWAVE CONFERENCE Warszawa, POLAND, 27-30/05.1996

W.Soluch, T.Wróbel, E.Lipińska

Institute of Electronic Materials Technology
ul. Wólczyńska 133, 01-919 Warszawa, Poland

SURFACE ACOUSTIC WAVE RESONATORS FOR PROFESSIONAL TELECOMMUNICATION APPLICATIONS

Surface acoustic wave (SAW) resonators for applications at professional telecommunication were designed, fabricated and tested. The frequences of three models of the resonators are equal to about 303 MHz, 357 MHz and 715 MHz. The resonators are mounted in the TO-8 metallic packages and sealed in the vacuum by cold welding. The resonators can operate in a two or one port configuration.

SAW resonators are high Q components used for frequency control in oscillators. They are generally applied as VHF/UHF local and voltage controlled crystal oscillators and low power transmitters in the frequency range from about 200 MHz to 1000 MHz. If the frequency is to be multiplied to a microwave range, the multiplication coefficient is much smaller compare to the case when bulk acoustic wave resonators (at much lower frequency) are used, and lower noise level is obtained.

A two port SAW resonator consists of two reflectors and two interdigital transducers deposited on the quartz substrate. The width of electrodes (aluminium) is equal to $\lambda/4$, where λ is the SAW wavelength. For quartz, the SAW velocity is equal to about 3150 m/s, then for the frequency 1000 M Hz we obtain $\lambda/4$ equal to about 0.8 μm. Therefore the metallic pattern (about 1000 of electrodes) of the SAW resonator is produced by the method of photolithography.

Several models of SAW resonators were designed, fabricated and tested at the Institute of Electronic Materials Technology.

Materiał prezentowano na sesji posterów.
Tekst wydrukowano w materiałach z konferencji.