ZAMONAVIY KO'RINISHGA EGA VAN-DER-PAU USULI ASOSIDAGI AVTOMATLASHTIRILGAN ELECTRON QURILMA

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Annotatsiya. Yarim o'tkazgichli materiallarni eletrofizik parametrlari y'ani zaryad tashuvchilar miqdorini, n va p turdagi yarimo'tkazgichli materiallarning harakatchanligini va solishtirma qarshigini o'lchashda zamonaviy ko'rinishga ega Van-der-Pau usuli asosidagi avtomatlashtirilgan electron qurilma ishlab chiqilgan.

Kalit suzlar:Yarim o'tkazgichlar, n va p tur, zaryad tashuvchilar miqdori, eletrofizik parametrlar.

АВТОМАТИЗИРОВАННОЕ ЭЛЕКТРОННОЕ УСТРОЙСТВО НА ОСНОВЕ МЕТОДА ВАН-ДЕР-ПАУ С СОВРЕМЕННЫМ ВНЕШНИМ ВИДОМ

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Разработка современного автоматизированного электронного устройства для измерения электрофизических параметров полупроводниковых материалов, а именно концентрации носителей заряда, подвижности и удельного сопротивления полупроводниковых материалов n- и p-типа на основе метода Ван-дер-Пау.

Ключевые слова: Полупроводник, носителией заряда, электрофизические параметри.

AUTOMATED ELECTRONIC DEVICE BASED ON THE VAN-DER-PAU METHOD WITH A MODERN APPEARANCE

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Development of a modern automated electronic device for measuring the electrophysical parameters of semiconductor materials, namely the concentration

of charge carriers, mobility and resistivity of n- and p-type semiconductor materials based on the Van der Pau method.
Key words: Semiconductor, charge carriers, electrophysical parameters.

So'nggi yillarda bevosita ushbu maqola mualliflari ishtirokida nanostrukturali kremniy asosida yangi avlod yarimo'tkazgich materialini yaratish bo'yicha tadqiqotlar olib borildi, buning natijasida zaryad tashuvchilarning solishtirma qarshiligi va harakatchanligini aniqlash kerak edi.1,2. Ushbu muammolarni hal qilishning istiqbolli usullaridan biri Van-der-Pau usuli bo'lib, u yarimo'tkazgichlarning o'tkazuvchanligi va yarimo'tkazgichlarning turini, ixtiyoriy namunalarningzaryad tashuvchilari miqdorini va Holl harakatchanligini aniqlash uchun ishlatiladi. Bu esa ular asosida yangi turdagi nanostrukturali yarimo'tkazgichli materiallar va qurilmalarni yaratish bo'yicha tadqiqotlarda juda muhim omil hisoblanadi.
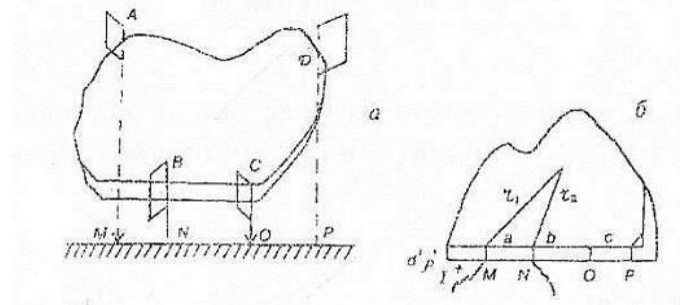
1-Rasm.Van-der-Pauusulibilansolishtirmaqarshiliknio'lchashdachiziqliA,   B,   C vaDkontaktlarni (originalda) asilnusxada (a), yassiyarimcheksizplastinada   M, N, O, Pkontaktlarningjoylashishi (б)

Buusulningqulayligishundanibotatki, yassinamunayonsirtigato'rttaA,B,C,Dnuqtaviy (yokichiziqli) kontaktolinib, AvaBkontaktlardantoko'tkaziladi, CvaD kontaktlarorasidagi potensiyallarayirmasio'lchanadi.So'ng esaAvaDkontaktlardantoko'tkaziladi.BvaCkontaktlarorasidagikuchlanisho'lchanibqarshil iklarhisoblanadi.RAva RBqarshiliklarnibilganholdasolishtirmaqarshilik

$$\rho = 4{,}531 \cdot d\left[\frac{R_A + R_B}{2}\right] \cdot f\left(\frac{R_A}{R_B}\right)$$

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Egamberdiyev B.E., Tachilin S.A., Toshev A.R., Isroilov F.M., DehkanovM.Sh. Study Of Formation Of Clusters Of Atoms Of Gadolinium In Silicon // Journal of Critical Reviews. Vol 7. Issue 3. 2020. ISSN- 2394-5125. DOI: dx.doi.org/10.31838/jcr.07.03.60

formulabilananiqlanadi. Buyerda: $f\left(\dfrac{R_A}{R_B}\right)$ qarshiliklarnisbatigabo'liqbo'lgan tuzatishfunksiyasi, d-namunaningqalinligi.Tuzatishfunksiyasini

$$\exp\left(-\frac{\ln 2}{f}\right)\mathrm{ch}\left[\frac{(R_A/R_B)-1}{(R_A/R_B)+1}\frac{\ln 2}{f}\right] = \frac{1}{2}$$

bilanhisoblashmumkin.Van-Der-Pauusuliningnazariyasikonformakslantirishnazariyasigaasoslangan.
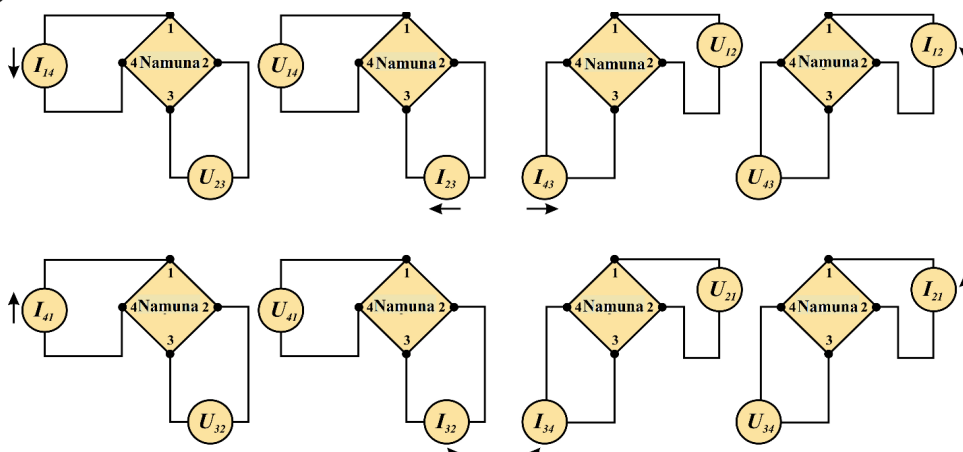
2-Rasm.   Yarimo'tkazgichlimateriallarnisolishtirmaqarshiliginio'lchovchiqurilmaniVan-Der-Pauusuliningtuzilishsxemasi
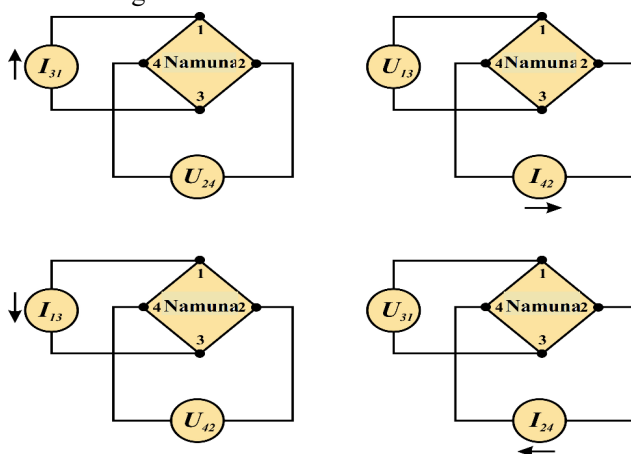
3-Rasm. Hollkuchlanishinio'lchashsxemasi.

O'rtachaHollkoeffitsientiniquyiagiqiymatbilananiqlanadi.

$$R^{H} = \frac{R^{H}_{13,24} + R^{H}_{24,13}}{2}$$

O'rtachaHollharakatchanligiesaquyiagiqiymatbilananiqlanadi.

$$\mu^{H} = \frac{R^{H}}{\rho}.$$

Zondlikontaktlarniboshqarishuchundasturlanganmaxsusplatformamikrokontroller Arduino Mega 2560 danfoydalanilan.

1-jadvalda yarimo'tkazgichlimateriallarniHollta'siriqurilmasiva biz yaratganVan-Der-Pauusullaridanfoydalanganholdaelekrtofizikparametrlarinio'lchabsolishtirilgan.

1-Jadval

№	Boshlang'ichnamuna	Turi	ρ(Ом·см)	μ (см2/В·с)	Na,Nd (см-3)

			1	2	1	2	1	2
1	КЭФ-100	n	101.4	99	1340	1143	4.14•1013	5.58•1013
2	КЭФ-1	n	0.95	0,929	1331	1133	4.9•1015	8,9•1015
3	КДБ-10	p	9.53	8.51	301	273	1,6•1015	2,29•1015
4	КДБ-5	p	4.82	4.11	348	426	3,6•1015	2,91•1015
5	КДБ-1	p	0.98	0.91	260	216	2.4•1016	3.5•1016

Jadvaldan kurinib turibdki Holl ta'siri qurilmasi va yaratilgan Van-Der-Pauu suliasosidagiqurilmadanolingannatijalarbir-biridandiyarlifarqqilmaydi.

Foydalanilgan adabiyotlar.

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