QUYOSH FOTOELEMENTINING QUVVATIGA MAGNIT MAYDON TA`SIRI

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Annotatsiya: Ushbu ishimizda quyosh fotoelementining quvvatiga magnit maydonni ta`sirini o'rganib chiqilgan. Magnit maydonining yo'nalishini o'zgartirish yo'li bilan fotoelementda ishlab chiqarilayotgan foydali quvvatga ta`sir o'tkazish mumkin. Magnit maydon ta`sirida fotoelementning quvvati kamayishi va buning sabablari tushuntirilgan.

Kalit so'zlar: Xoll kuchlanishi, geterostruktura, VAX-volt-amper xarakteristika, baza qarshilik, sirqish qarshilik

EFFECT OF MAGNETIC FIELD ON THE POWER OF THE SOLAR PHOTO ELEMENT

Annotation: In this study, the effect of a magnetic field on the power of a solar photocell was studied. By changing the direction of the magnetic field, it is possible to influence the useful energy produced by the photocell. The reasons for the decrease in the strength of the photocell under the influence of a magnetic field are explained.

Keywords: Hall voltage, heterostructure, I–V characteristic, base resistance, leakage resistance.

Xozirgi kunda qayta tiklanuvchi energiya manbalaridan energiya olish eng keng foydalanilayotgan talablardan biri bo‘lib kelmoqda. Qayta tiklanuvchi energiya manbalari orasida ko‘p ishlatiladigani bu quyosh elementidir. Ya’ni quyosh energiyasini elektr energiyasiga aylantirish ham arzon ham qulay hisoblanadi[1-3].

Aynan hozirda geterostrukturali, perovskidli va organik birikmalar asosida olinyapgan fotoelementlarning effektivligini o‘rganib solishtirilmoqda.

Biz ushbu ishimizda quyosh fotoelementining quvvatiga magnit maydonni ta`sirini o‘rganib chiqdik.

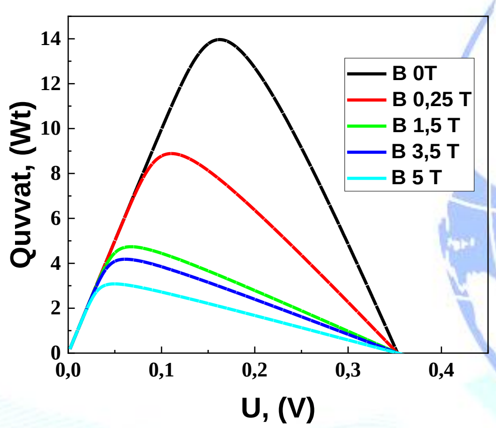
p-n o‘tishning VAXsiga magnit maydon va yorug‘likni ta`sir ettirib

$$j = j_s\left(e^{\frac{e\varphi_0}{kT}-\frac{e\left(\varphi_0-U-U_1+J\left(\left(R_b-\mathrm{AU}^n\right)+\mathrm{aR}_x J\beta x\right)\right)}{kT_e}}-1\right)+\frac{U}{R_u}-J_f$$

olgan ifodamizni kuchlanishni ko‘paytirib fotoelementning quvvatini ifodalovchi formula keltirib chiqarib olamiz.

$$P = \left(j_s\left(e^{\frac{e\varphi_0}{kT}-\frac{e\left(\varphi_0-U-U_1+J\left(\left(R_b-\mathrm{AU}^n\right)+\mathrm{aR}_x J\beta x\right)\right)}{kT_e}}-1\right)+\frac{U}{R_u}-J_f\right)\cdot U \qquad (1)$$

(1) Ifodaga berilgan son qiymatlarni qo‘yish orqali qo‘yidagi grafikga ega bo‘lamiz.



1 rasm. Turli magnit maydon ta`sirida quvvatni kuchlanishga bog‘liqligi.

B ortib borgan sari fotoelementning maksimal quvvati kamayib borar ekan.

Ushbu ishida p-n o‘tishning VAXsiga magnit maydonning son qiymatidan tashqari yo‘nalishi ta`sir qilishi ham o‘rganilgan. Dioddan o‘tayotgan tok zichligi yo'nalishi bilan magnit maydonning yo'nalishi orasidagi burchak potensial to'siq balandligiga ta`sir qiladi. Buning natijasida dioddan o'tayotgan tok magnit maydoning yo'nalishiga bog'liq bo'ladi [4,5].

Bu esa o'z navbatida diodning VAXiga magnit maydonning p-n o'tish tekisligiga qanday yo'nalgan ekanligiga bog'liq bo'ladi. ishda magnit maydonnining p-n o'tish tekisligiga perpendikulyar yo'nalishi bilan xosil qilingan burchagi dioddagi kuchlanishga $V = V_0 + \Delta V \sin^2 \alpha$ ko'rinishida o'zgarishini tajribada aniqlangan. Biroq bu yerda ikkinchi xad $\Delta V \sin^2 \alpha$ imperik tanlab olingan. Nazariy jixatdan asoslanmagan.

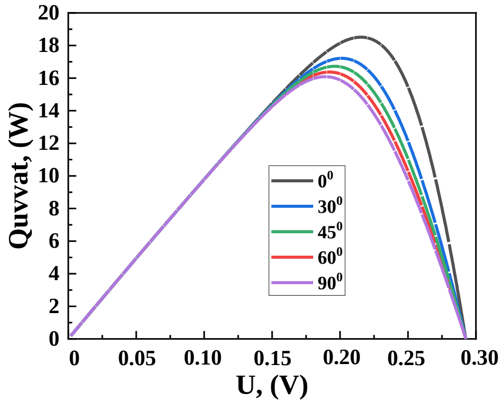
Bizga ma`lumki magnit maydonda xarakatlanayotgan zaryadlarga ta`sir qiluvchi kuch Lorens kuchi bo'lib $F = qB\vartheta \sin\alpha$ burchak sinusining birinchi darajasiga bog'liq bo'ladi.

Shuning uchun na`munada yuzaga keluvchi Xoll kuchlanishi xam $\sin\alpha$ ga proporsional bo'lishi kerak. Basharti tok kuch chiziqlarining magnit magnit maydonida egilishini xisobga oladigan bo'lsak u xolda Xoll kuchlanishining p-n o'tish tekisligiga perpendikulyartashkil etuvchisi yuzaga keladi. Bu esa p-n o'tishga qo'shilgan tashqi kuchlanishga qo'shimcha Xoll kuchlanishiga proporsional bo'lgan qo'shimcha kuchlanishni xosil bo'lishiga olib keladi[6,7]. Agarda magnit maydoni xisobiga yuzaga keluvchi Xoll kuchlanishi bilan bog'liq bo'lgan potensial to'siq balandligini o'zgarishini hisobga olsak, dioddan o'tayotgan tokning magnit maydoniga bog'liqligini qo'yidagi ko'rinishda yozishimiz mumkin [8].

$$P = \left(j_s \left(e^{\frac{e\varphi_0}{kT} - \frac{e\left(\varphi_0 - U - U_1 + J((R_b - \mathrm{AU}^n) + \mathrm{aR_x} J\beta \sin\alpha)\right)}{kT_e}} - 1 \right) + \frac{U - J((R_b - \mathrm{AU}^n)}{R_u} - J_f \right) \cdot U \quad (3)$$

Bu yerda potensial to'siqning balandligini o'zgarishi $\sin\alpha$ gaproporsional bo'ladi.

Fotoelementning quvvatini burchakka bog'liqligini grafiklarini olaylik.



2-rasm Turli burchaklar uchun quvvatning kuchlanishga bog‘liqlik grafiklari keltirilgan.

(2) rasmda fotoelement quvvatining (3) ifodalardan foydalangan holda turli burchaklar uchun quvvatning kuchlanishga bog‘liqlik grafiklari keltirilgan. Grafiklardan ko‘rinib turibdiki turli burchaklar uchun quvvat grafiklari ham turlicha bo‘lgan. α burchak 0 bo‘lgan xol uchun fotoelementning quvvati berilgan magnit maydonida eng katta qiymatga erishgan. Shunday qilib magnit maydonining yo‘nalishini o‘zgartirish yo‘li bilan fotoelementda ishlab chiqarilayotgan foydali quvvatga ta`sir o‘tkazish mumkin[9,10].

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