半导体探测器与α粒子能损实验数据处理及结果

[redacted]

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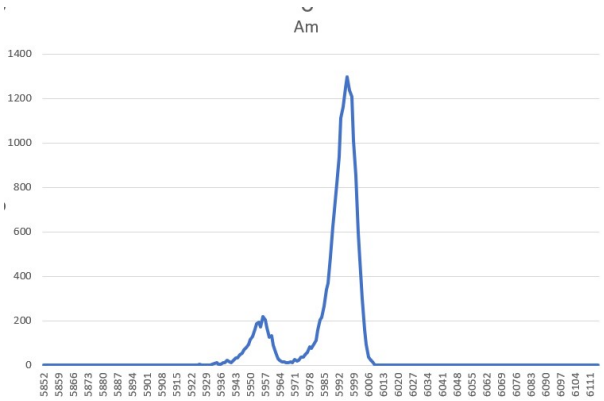
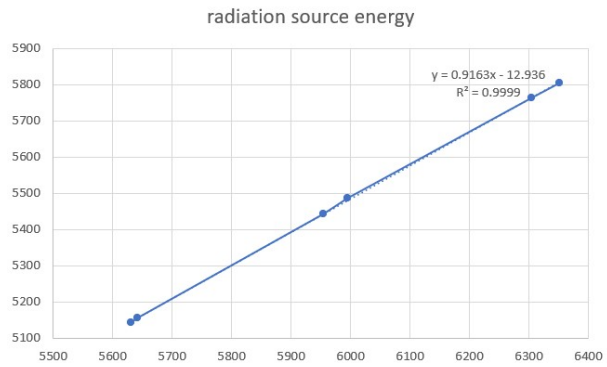
1 实验结果

1.将测量的$^{241}Am\alpha$谱以多道的道数为横坐标，以计数为纵坐标描绘在坐标纸上，算出能量分辨率。如图

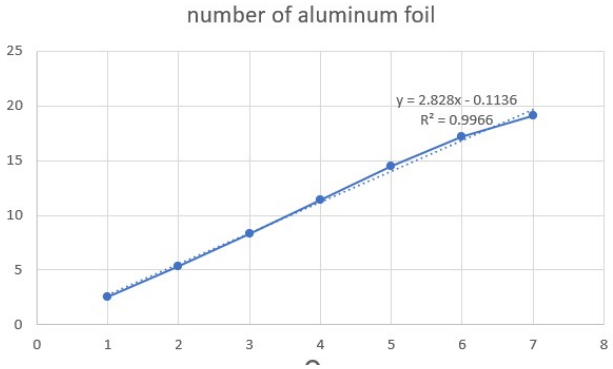


能量分辨率:0.1943%(最大的那个，$E = 5996keV$，$FWHM = 11.652keV$)0.1940%(小的那个，$E = 5956keV$，$FWHM = 11.637keV$) 2.以放射源$^{241}Amand^{239}Pu$等放射源的能量为横坐标，以全能峰道址为纵坐标在坐标纸上作能量和幅度校准曲线。如图

3.计算铝箔对于^{241}Am放射源α粒子的阻止能力$\frac{\mathrm{d}E}{\mathrm{d}x}$平均及薄箔的厚度，并以铝箔层数为横坐标，厚度为纵坐标，进行线性拟合，计算铝箔的单片厚度。$\Sigma_e = 25.0511eV/10^{15}atom$,and $(\frac{\mathrm{d}E}{\mathrm{d}x})_{Average} = N\Sigma_e$;also we have $N_{aluminum} = 6.02 \times 10^{22}atom/cm^2$ so that we can get $(\frac{\mathrm{d}E}{\mathrm{d}x})_{Average} = 150.807keV/\mu m$. Then we can use the previous curve to get the energy



which α rays had passed 1 to 7 layers aluminum sheet, these energies are respectively 6181.31, 5792.79, 5373.72, 4921.9, 4459.17, 3952.78, 3306.71; so we can use these energy to get the thickness of aluminum sheet:2.57627, 5.35512, 8.35114, 11.4195, 14.5827, 17.1645, 19.0614, then form a figure



we get that the thickness are approximately $2.828\mu m$ 4.For mylar($C_{10}H_8O_4$) Like aluminum, we use the same way to calculate. But we should use the compound formula

$(\frac{\mathrm{d}E}{\mathrm{d}x})_{total} = \Sigma \frac{1}{compound\ molecular\ weight}[(particular\ atomic\ mass) \times (it's\ number) \times (\frac{\mathrm{d}E}{\mathrm{d}x})]$

$(\frac{\mathrm{d}E}{\mathrm{d}x})_C = N(C)\Sigma_C = 160.749keV/\mu m$

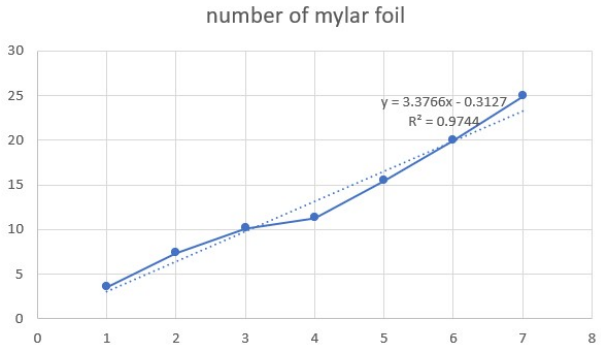
$(\frac{\mathrm{d}E}{\mathrm{d}x})_H = N(H)\Sigma_C = 0.018keV/\mu m$

$(\frac{\mathrm{d}E}{\mathrm{d}x})_O = N(O)\Sigma_C = 0.0934keV/\mu m$

$(\frac{\mathrm{d}E}{\mathrm{d}x})_{total} = \frac{1}{192}[10 \times 12 \times (\frac{\mathrm{d}E}{\mathrm{d}x})_C + 8 \times 1 \times (\frac{\mathrm{d}E}{\mathrm{d}x})_H + 4 \times 16 \times (\frac{\mathrm{d}E}{\mathrm{d}x})_O] = 100.5$

Likewise, we use the previous curve to get the energy which α rays had passed 1 to

7 layers mylar sheet, these energies are respectively 6217.33, 5862.64, 5487.22, 5087.78, 4665.43, 4215.8, 3721.42, so we can use these energy to get the thickness of aluminum sheet:3.52925, 7.26478, 10.8193, 11.2393, 15.4418, 19.9157, 24.8349 then form a figure



we get that the thickness are approximately $3.376\mu m$

2 appendix-code

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1 test
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Listing 1: 0.1s