Rayos_X

May 25, 2020

[1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib auto
```

```
Using matplotlib backend: MacOSX
```

[2]:
```
dataset = pd.read_excel("Ejercicio_Rayos_X.xlsx",sheet_name='Espectros')
```

[3]:
```
dataset.shape
```

[3]:
```
(2048, 6)
```

[4]:
```
dataset.describe()
```

[4]:

	Número de canal	Energía	241Am	Mn	U	Th
count	2048.000000	2048.000000	2048.000000	2048.000000	2048.000000	2048.000000
mean	1024.500000	38.921900	42.711914	17.388672	12.606445	14.128418
std	591.350996	22.471338	234.391201	250.937849	64.343343	74.221546
min	1.000000	0.028900	0.000000	0.000000	0.000000	0.000000
25%	512.750000	19.475400	0.000000	0.000000	0.000000	0.000000
50%	1024.500000	38.921900	3.000000	0.000000	0.000000	0.000000
75%	1536.250000	58.368400	17.000000	2.000000	5.000000	4.000000
max	2048.000000	77.814900	3849.000000	6832.000000	994.000000	1230.000000

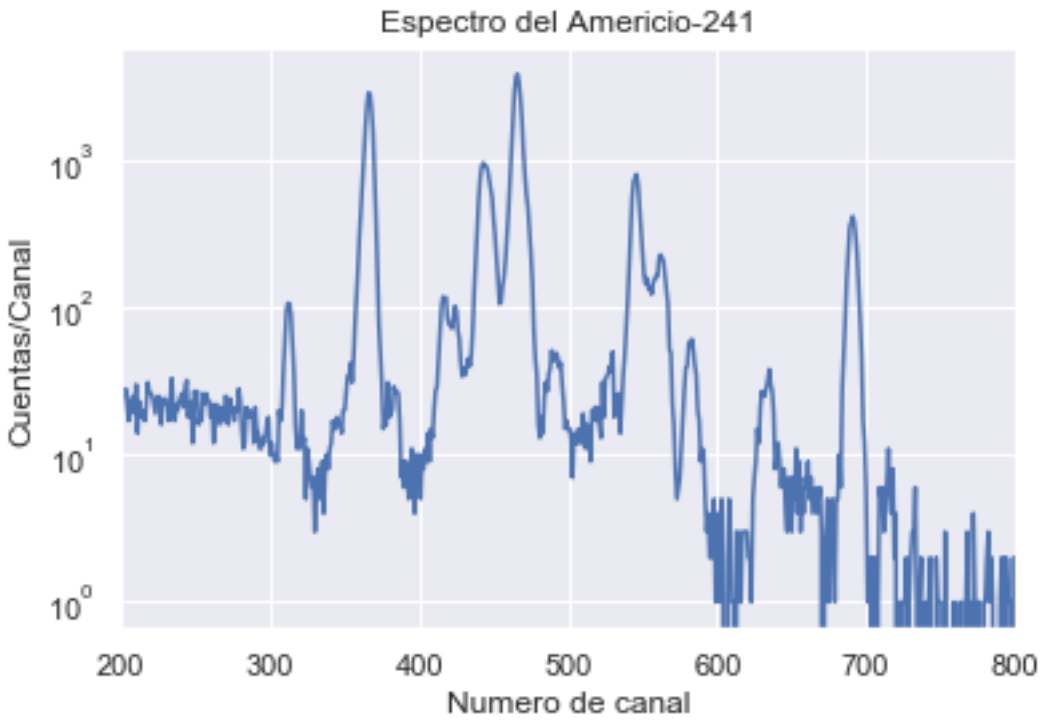
[5]:
```
dataset.head()
```

[5]:

	Número de canal	Energía	241Am	Mn	U	Th
0	1	0.0289	0	0	0	0
1	2	0.0669	0	0	0	0
2	3	0.1049	0	0	0	0
3	4	0.1429	0	0	0	0
4	5	0.1809	0	0	0	0

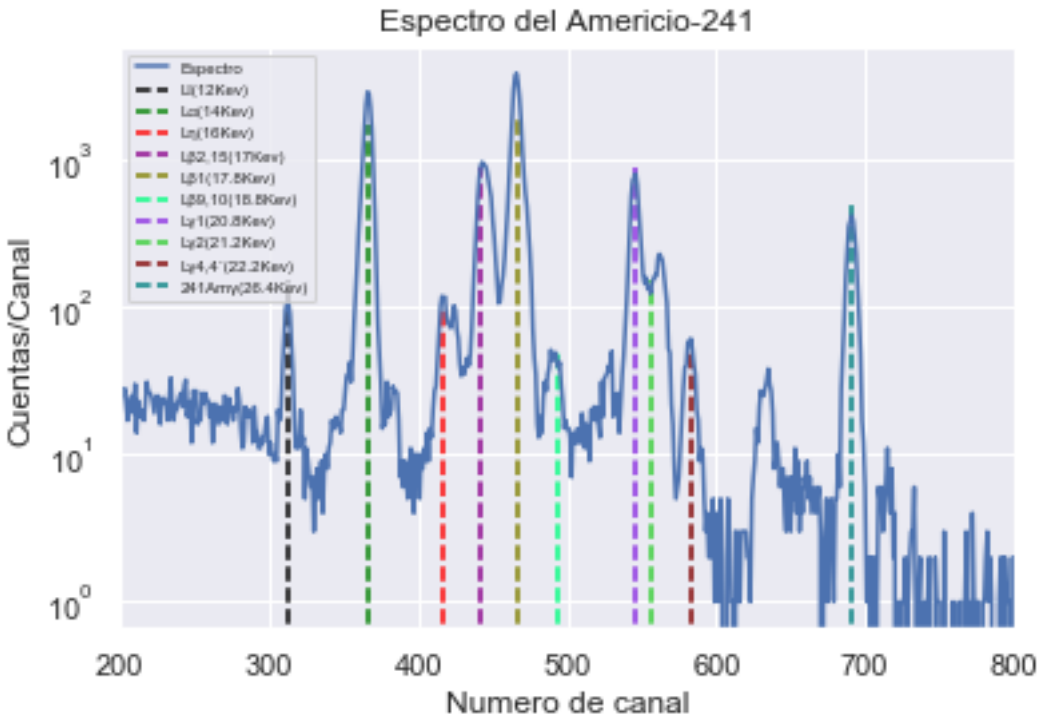
[6]:
```
x0 = dataset["Número de canal"]
y0 = dataset["241Am"]
```

[8]:
```
plt.plot(x0,y0)
#limites=[200,800,0,8000]
#plt.axis(limites)
plt.xlim(200,800)
plt.yscale('log')
plt.title('Espectro del Americio-241')
plt.xlabel('Numero de canal')
plt.ylabel('Cuentas/Canal')
sns.set()
plt.show()
```



[9]:
```
fig, ax = plt.subplots()
plt.plot(x0,y0,label='Espectro')
```

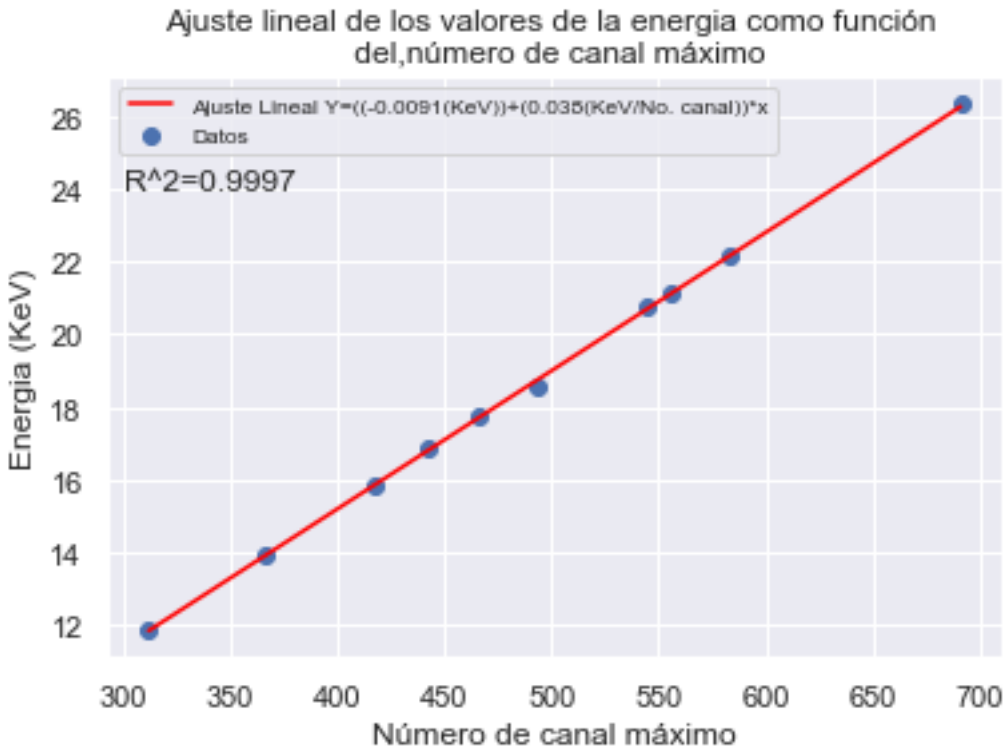
```
ax.vlines(x=312, ymin=0.0,ymax=150,␣
 ↪color='black',linestyle="--",label='Ll(12Kev)')
ax.vlines(x=366, ymin=0.0,ymax=1700,␣
 ↪color='green',linestyle="--",label='L (14Kev)')
ax.vlines(x=417, ymin=0.0,ymax=100,␣
 ↪color='red',linestyle="--",label='L (16Kev)')
ax.vlines(x=442, ymin=0.0,ymax=900,␣
 ↪color='darkmagenta',linestyle="--",label='L 2,15(17Kev)')
ax.vlines(x=466, ymin=0.0,ymax=2000, color='olive',linestyle="--",label='L 1(17.
 ↪8Kev)')
ax.vlines(x=493, ymin=0.0,ymax=50,␣
 ↪color='springgreen',linestyle="--",label='L 9,10(18.8Kev)')
ax.vlines(x=545, ymin=0.0,ymax=900,␣
 ↪color='blueviolet',linestyle="--",label='L 1(20.8Kev)')
ax.vlines(x=556, ymin=0.0,ymax=150,␣
 ↪color='limegreen',linestyle="--",label='L 2(21.2Kev)')
ax.vlines(x=583, ymin=0.0,ymax=50,␣
 ↪color='maroon',linestyle="--",label='L 4,4´(22.2Kev)')
ax.vlines(x=691, ymin=0.0,ymax=500,␣
 ↪color='teal',linestyle="--",label='241Am (26.4Kev)')
plt.xlim(200,800)
plt.yscale('log')
plt.title('Espectro del Americio-241')
plt.xlabel('Numero de canal')
plt.ylabel('Cuentas/Canal')
plt.legend(['Espectro','Ll(12Kev)','L (14Kev)','L (16Kev)',
            'L 2,15(17Kev)','L 1(17.8Kev)','L 9,10(18.8Kev)',
            'L 1(20.8Kev)','L 2(21.2Kev)','L 4,4´(22.2Kev)',
            '241Am (26.4Kev)'],loc=2,fontsize = 'x-small',prop={'size': 6})
sns.set()
plt.show()
```



[10]:
```
dataset1 = pd.read_excel("Ejercicio_Rayos_X.xlsx",sheet_name='Hoja1')
```

[11]:
```
x1 = dataset1["NumeroCanal"]
y1 = dataset1["Energía [KeV]"]
```

[12]:
```
fig, ax = plt.subplots()
plt.scatter(x1,y1,label='Datos')
plt.plot(x1,(-0.0091)+(0.038)*x1,color='red',label = 'Ajuste Lineal')
plt.title('Ajuste lineal de los valores de la energia como función \n␣
 ↪del,número de canal máximo')
plt.legend(['Ajuste Lineal Y=((-0.0091(KeV))+(0.038(KeV/No. canal))*x','Datos'],
           loc=2,fontsize = 'x-small')
plt.text(300,24, 'R^2=0.9997')
plt.xlabel('Número de canal máximo')
plt.ylabel('Energia (KeV)')
plt.show()
```



0.1 Espectro del Mn

[13]:
```
dataset.head()
```

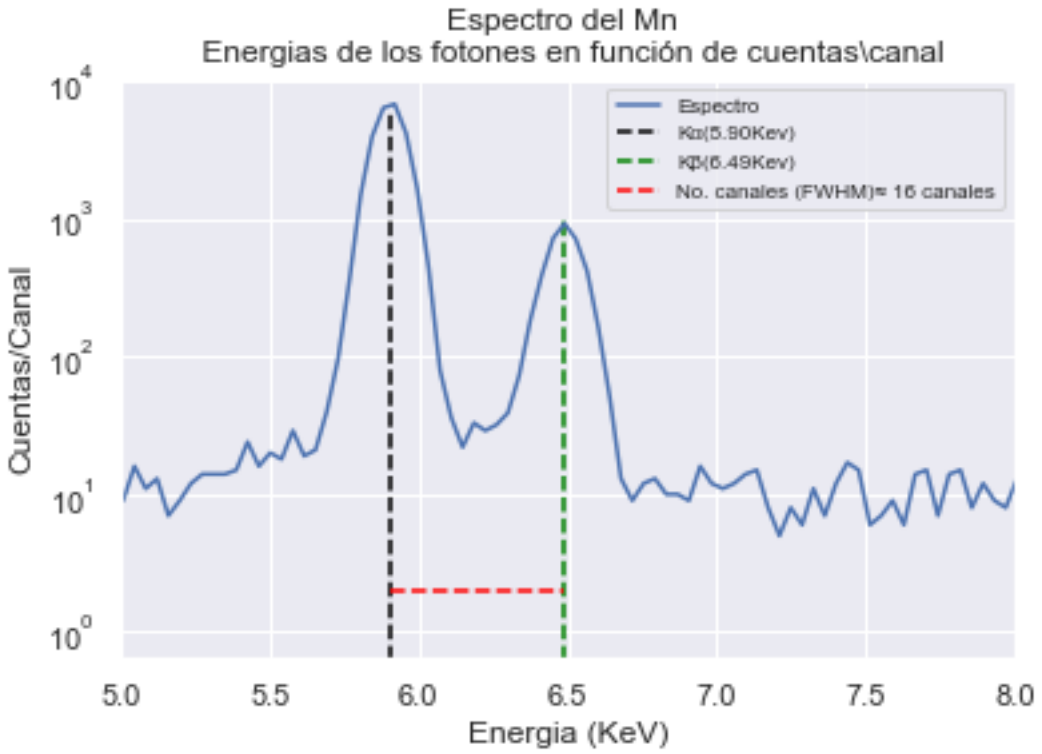
[13]:

	Número de canal	Energía	241Am	Mn	U	Th
0	1	0.0289	0	0	0	0
1	2	0.0669	0	0	0	0
2	3	0.1049	0	0	0	0
3	4	0.1429	0	0	0	0
4	5	0.1809	0	0	0	0

[14]:
```
x2 = dataset["Energía"]
y2 = dataset["Mn"]
```

[15]:
```
fig, ax = plt.subplots()
plt.plot(x2,y2,label='Espectro')
plt.xlim(5,8)
ax.vlines(x=5.90, ymin=0.0,ymax=5900, color='black',linestyle="--",label='K (5.
 ↪90Kev)')
ax.vlines(x=6.49, ymin=0.0,ymax=970, color='green',linestyle="--",label='K (6.
 ↪49Kev)')
```

```
ax.hlines(y=2, xmin=5.90,xmax=6.49, color='red',linestyle="--",label='No.␣
 ↪canales (FWHM)  16 canales')
plt.title('Espectro del Mn \n Energias de los fotones en función de␣
 ↪cuentas\canal')
plt.legend(['Espectro','K (5.90Kev)','K (6.49Kev)','No. canales (FWHM)  16␣
 ↪canales'],loc=1,prop={'size': 8})
plt.xlabel('Energia (KeV)')
plt.ylabel('Cuentas/Canal')
plt.yscale('log')
sns.set()
plt.show()
```

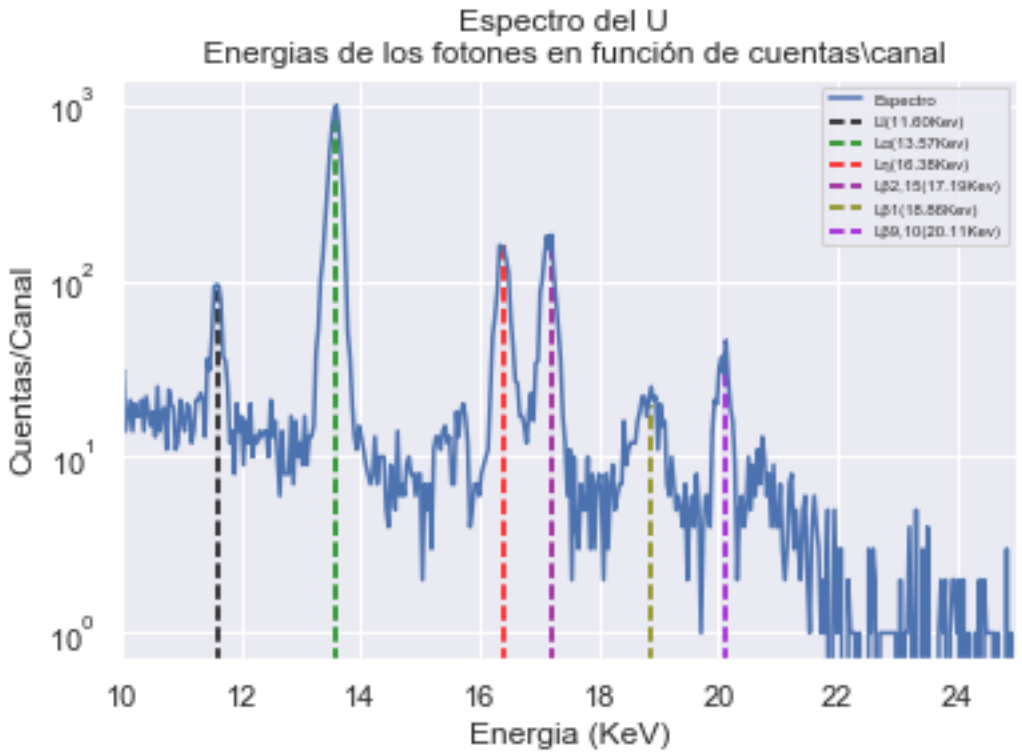


0.2 Espectro del U

[16]:
```
x2 = dataset["Energía"]
y2 = dataset["U"]
```

[17]:
```
fig, ax = plt.subplots()
plt.plot(x2,y2,label='Espectro')
plt.xlim(10,25)
```

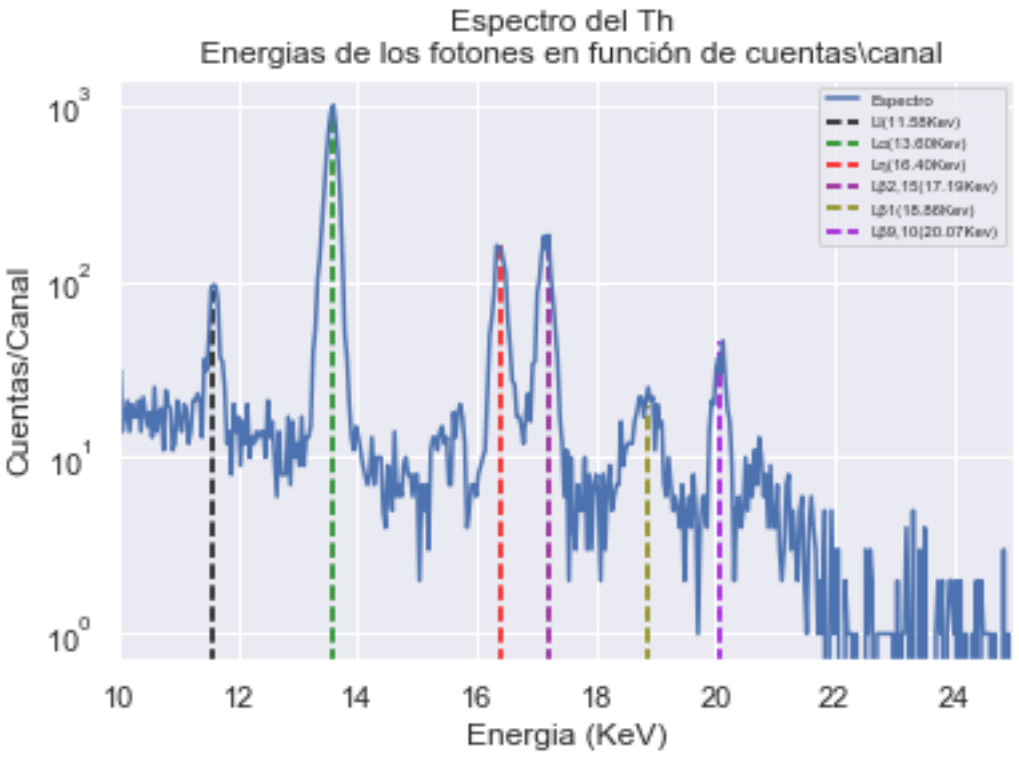
```
plt.title('Espectro del U \n Energias de los fotones en función de␣
 ↪cuentas\canal')
plt.xlabel('Energia (KeV)')
plt.ylabel('Cuentas/Canal')
ax.vlines(x=11.60, ymin=0.0,ymax=90, color='black',linestyle="--",label='Ll(11.
 ↪60Kev)')
ax.vlines(x=13.57, ymin=0.0,ymax=900, color='green',linestyle="--",label='L (13.
 ↪57Kev)')
ax.vlines(x=16.38, ymin=0.0,ymax=160, color='red',linestyle="--",label='L (16.
 ↪38Kev)')
ax.vlines(x=17.19, ymin=0.0,ymax=160,␣
 ↪color='darkmagenta',linestyle="--",label='L 2,15(17.19Kev)')
ax.vlines(x=18.86, ymin=0.0,ymax=20, color='olive',linestyle="--",label='L 1(18.
 ↪86Kev)')
ax.vlines(x=20.11, ymin=0.0,ymax=45,␣
 ↪color='darkviolet',linestyle="--",label='L 9,10(20.11Kev)')
plt.legend(['Espectro','Ll(11.60Kev)','L (13.57Kev)','L (16.38Kev)',
            'L 2,15(17.19Kev)','L 1(18.86Kev)','L 9,10(20.
 ↪11Kev)'],loc=1,prop={'size': 6})
plt.yscale('log')
sns.set()
plt.show()
```



0.3 Espectro del Th

[18]:
```
x3 = dataset["Energía"]
y3 = dataset["Th"]
```

[19]:
```
fig, ax = plt.subplots()
plt.plot(x2,y2,label='Espectro')
plt.xlim(10,25)
plt.title('Espectro del Th \n Energias de los fotones en función de␣
 ↪cuentas\canal')
plt.xlabel('Energia (KeV)')
plt.ylabel('Cuentas/Canal')
ax.vlines(x=11.58, ymin=0.0,ymax=90, color='black',linestyle="--",label='Ll(11.
 ↪58Kev)')
ax.vlines(x=13.60, ymin=0.0,ymax=900, color='green',linestyle="--",label='L (13.
 ↪60Kev)')
ax.vlines(x=16.40, ymin=0.0,ymax=160, color='red',linestyle="--",label='L (16.
 ↪40Kev)')
ax.vlines(x=17.19, ymin=0.0,ymax=160,␣
 ↪color='darkmagenta',linestyle="--",label='L 2,15(17.19Kev)')
ax.vlines(x=18.86, ymin=0.0,ymax=20, color='olive',linestyle="--",label='L 1(18.
 ↪86Kev)')
ax.vlines(x=20.07, ymin=0.0,ymax=45,␣
 ↪color='darkviolet',linestyle="--",label='L 9,10(20.07Kev)')
plt.legend(['Espectro','Ll(11.58Kev)','L (13.60Kev)',
            'L (16.40Kev)','L 2,15(17.19Kev)','L 1(18.86Kev)',
            'L 9,10(20.07Kev)'],loc=1,prop={'size': 6})
plt.yscale('log')
sns.set()
plt.show()
```


Espectro del Th
Energias de los fotones en función de cuentas\canal
Cuentas/Canal
Energia (KeV)
Espectro
Lℓ(11.55Kev)
Lα(13.60Kev)
Lγ(16.40Kev)
Lβ2,15(17.19Kev)
Lβ1(18.58Kev)
Lβ9,10(20.07Kev)