Susceptibility measurement

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Ukázka měřícího protokolu.

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1 Data collecting

Stažení dat - využití command line pomocí ipython magic.

```
!curl https://user.mgml.eu/automation/vsm/00000001.dat --output 01.dat
```

```
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed

  0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--     0
100 32937  100 32937    0     0   243k      0 --:--:-- --:--:-- --:--:--  247k
```

2 NumPy

Budeme využívat znalosti ze článku v **Nature** o magnetizaci [1].

```
import numpy as np
a = np.arange(15).reshape(3, 5)
a
```

```
array([[ 0,  1,  2,  3,  4],
       [ 5,  6,  7,  8,  9],
       [10, 11, 12, 13, 14]])
```

3 Pandas

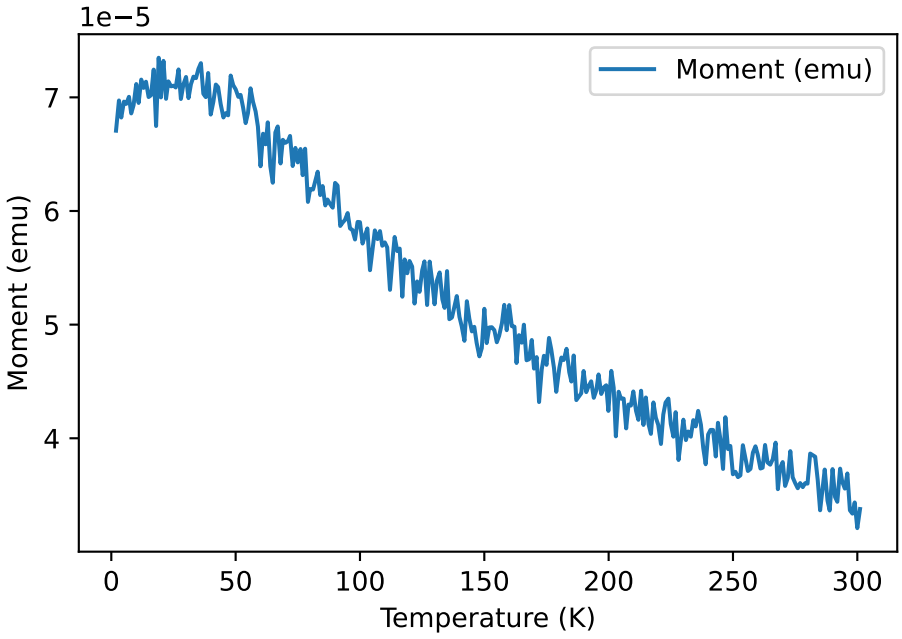
```
import pandas as pd
import re
pd.options.plotting.backend = "matplotlib"

header = {}
with open("01.dat", "r") as f:
    for line in f:
      if r := re.match(r'^INFO,([^,]*),([^,]*)$', line):
        header[r[2].strip()] = r[1]
      if line.strip() == "[Data]":
        break
    df = pd.read_csv(f, delimiter=",", index_col="Temperature (K)")

print(header)
df[['Moment (emu)']].plot(ylabel='Moment (emu)')
```

```
{'APPNAME': 'PPMS VSM Option Release 1.4.10 Build 3', 'MOTOR_MODULE_NAME': 'Quantum Design L
```

```
<Axes: xlabel='Temperature (K)', ylabel='Moment (emu)'>
```



4 Ukázka plotly na rawdata

```
pd.options.plotting.backend = "plotly"

df[['Moment (emu)']].plot(y='Moment (emu)')
```

```
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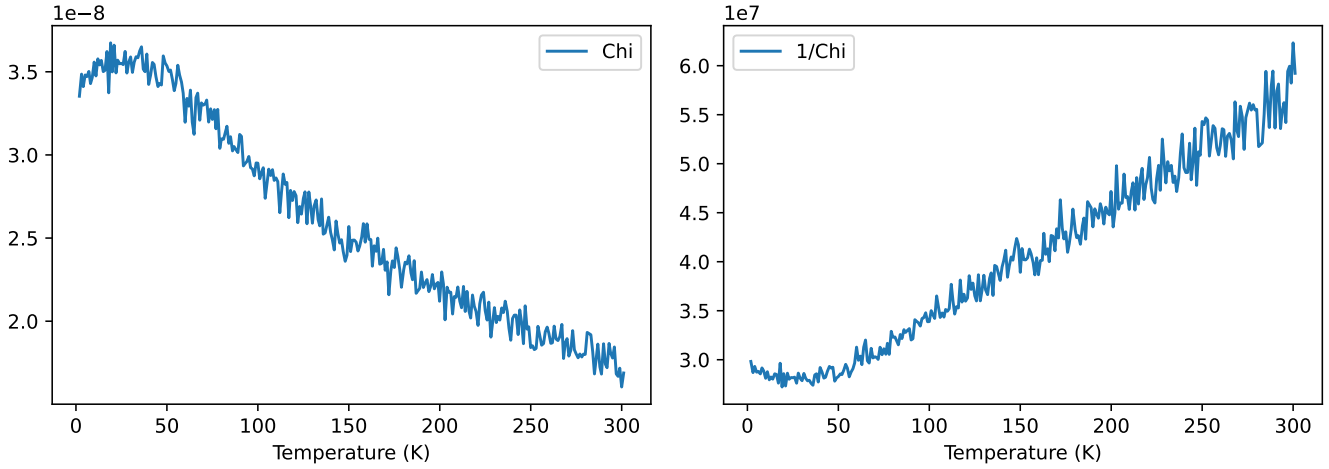
```
Unable to display output for mime type(s): text/html
```

5 Více sloupců

Provedli jsme měření na sloučenine RnAc5Mn5Nb a výsledek vidíte na Figure 1. Konkrétně na Figure 1a je vidět magnetická susceptibilita a na dalším Figure 1b je její inverzní hodnota.

[1] S. Mugiraneza and A. M. Hallas, *Tutorial: A Beginner's Guide to Interpreting Magnetic Susceptibility Data with the Curie-Weiss Law*, Communications Physics **5**, 95 (2022).



(a) Susceptibilita

(b) Inverzní susceptibilita

Figure 1: Naměřená data