CC04 Optics Practicals

Newton's Ring

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
import scipy as sp
from scipy.optimize import curve_fit
import sympy as smp
```

x_data: Ring no. (m).

y_data: D_m^2 (in mm^2), where D_m is the diameter of the m^{th} ring.

In [2]:
```
x_data = np.array([5,10,15,20])
y_data = np.array([5.905,9.797,13.4506,18.2116])
R = 34.78   # radius of curvature of the lens (in cm)
```

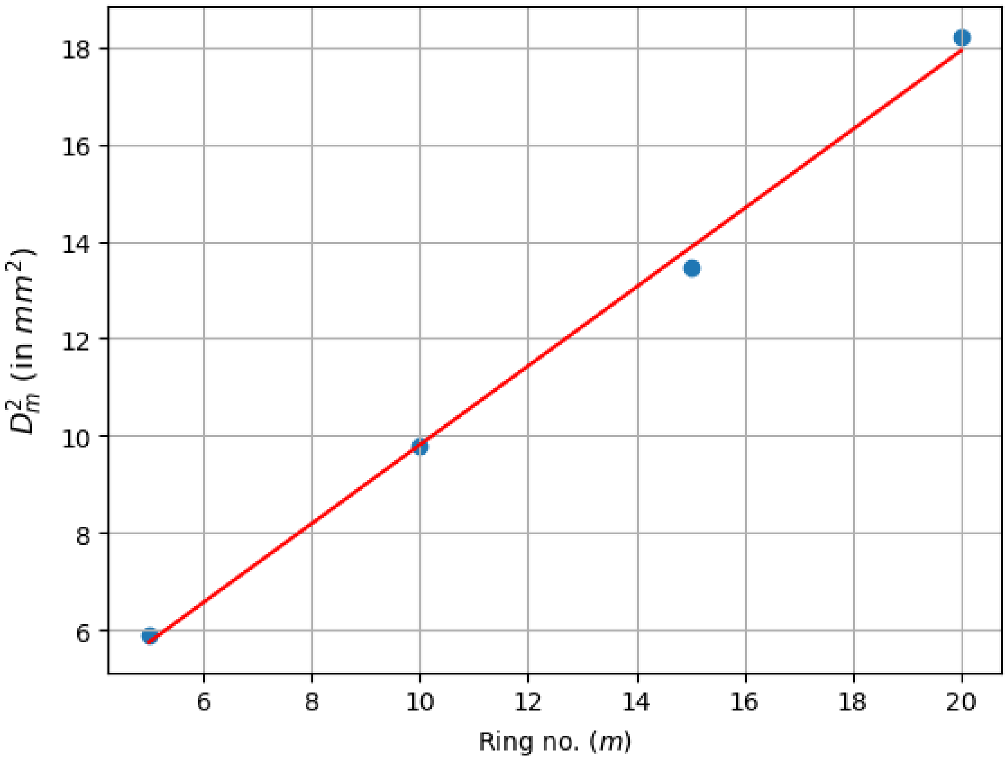
In [3]:
```python
def model_f(x, a, b):
    return a*x + b

popt, pcov = curve_fit(model_f, x_data, y_data, p0=[1,0])
a_opt, b_opt = popt
x_model = np.linspace(min(x_data), max(x_data), 100)
y_model = model_f(x_model, a_opt, b_opt)

plt.scatter(x_data,y_data)
plt.plot(x_model,y_model, color='r')
plt.xlabel('Ring no. ($m$)')
plt.ylabel('$D_m^2$ (in $mm^2$)', fontsize=12)
plt.grid()
plt.show()

x, y, lam = smp.symbols('x y \lambda', real=True, positive=True)
y = a_opt*x + b_opt
lam = (a_opt*10**(-6))/(4*R*10**(-2)) * 10**(9)  # in nm

print('equation of the straight line, Dm2 =', y.subs(x,'m'), '\n')
print('Slope of the graph =', a_opt, '\n')
print('Wavelength of Na light is', lam, 'nm.')
```




```
equation of the straight line, Dm2 = 0.811467999999589*m + 1.6977000000037

Slope of the graph = 0.8114679999995887

Wavelength of Na light is 583.2863714775652 nm.
```

In [ ]: