

Supplementary Information

For isotopic dilution analysis the following equations were applied.

$$F = \frac{\ln\left(\frac{R_{meas}}{R_{real}}\right)}{\Delta m} \quad \text{Equation 1: Determination of mass bias factor.}$$

F - mass bias factor per mass unit

R - isotope ratio

Δm - mass difference between isotopes

$$c_{Sp} = c_s \frac{m_s}{m_{Sp}} \cdot \frac{M_{Sp}}{M_s} \cdot \frac{A_s}{A_{Sp}} \left(\frac{R_m - R_{Sp}}{1 - R_m R_{Sp}} \right) \quad \text{Equation 2: Determination of spike concentration.}$$

c_{S/Sp} - concentration of the standard and the spike

m_{S/Sp} - mass taken from standard and the spike

M_{S/Sp} - elemental atomic weights of the element in the standard and the spike

A_{S/Sp} - isotope abundance of standard and spike

R_{m/S/Sp} - isotope ratio measured, for the standard and for the spike

$$R_m = \frac{R_{meas}}{\exp(F \Delta m)} \quad \text{Equation 3: Determination of isotope ratio.}$$

R_m - corrected isotope ratio

R_{meas} - measured isotope ratio

F - mass bias factor

Δm - mass difference between isotopes

$$I_{corr/meas}(cps) = I_{meas}(cps) \cdot \frac{F}{\exp(\Delta m R_{meas})} \quad \text{Equation 4: Correction of cps for isotopic distribution.}$$

I_{corr/meas}(cps)- corrected and measured intensities in cps

F - mass bias factor

Δm - mass difference between isotopes

R_{meas} - measured isotope ratio

$$T(s) = 1 - \frac{I_{meas}}{I_{meas} + I_{corr}} \quad \text{Equation 5: Determination of detector dead time.}$$

T(s) - dead time of detector in sec

I_{meas/corr} - measured and corrected intensities in cps

$$MF_S = c_{Sp} d_{Sp} F_{Sp} \frac{AW_S}{AW_{Sp}} \frac{A_{Sp}^b}{A_S^a} \left(\frac{R_m - R_{Sp}}{1 - R_m R_S} \right)$$

Equation 6: Determination of mass flow.

MFs - mass flow sample

c_{Sp}d_{Sp}F_{Sp} - mass flow spike

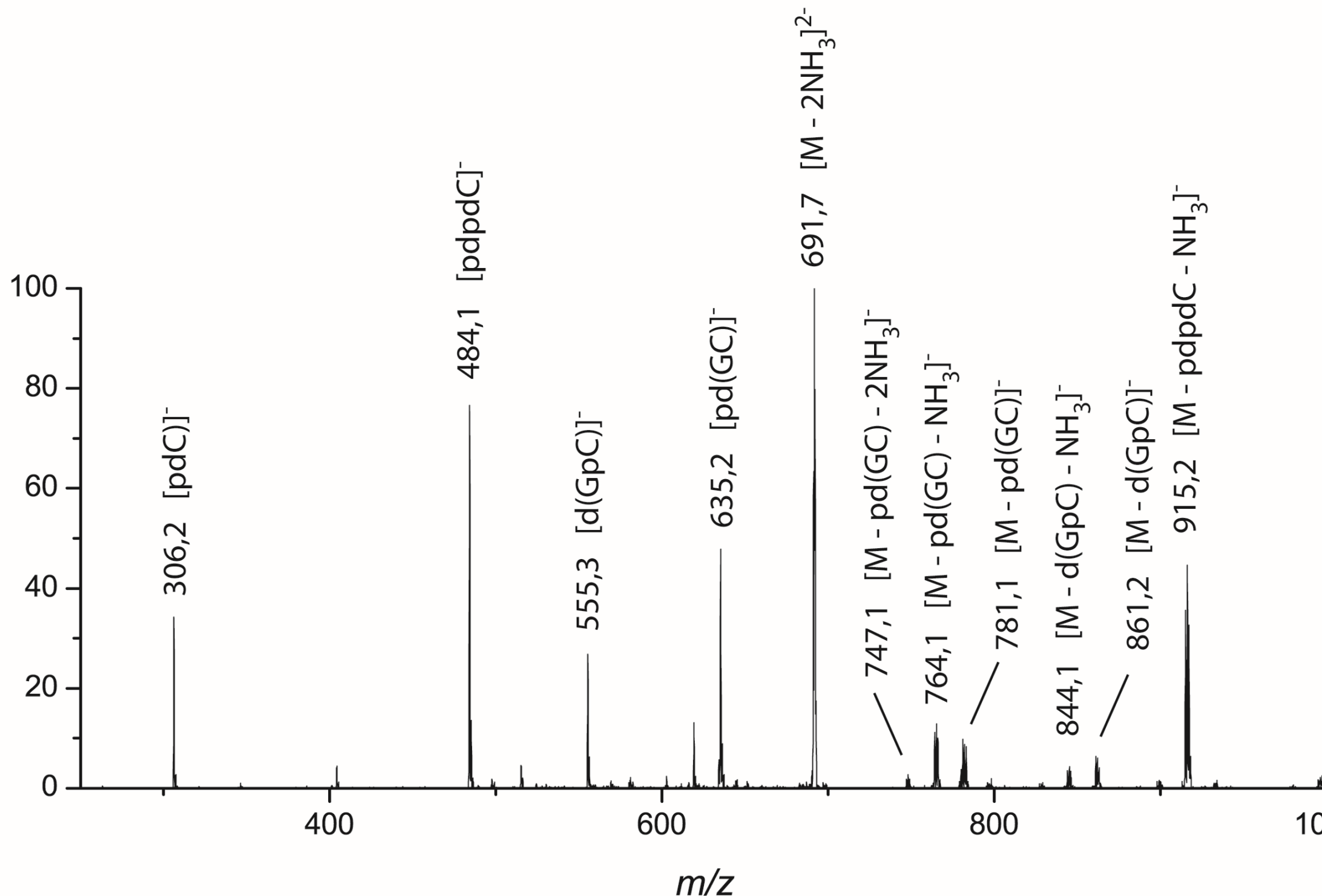
AW - atomic weight

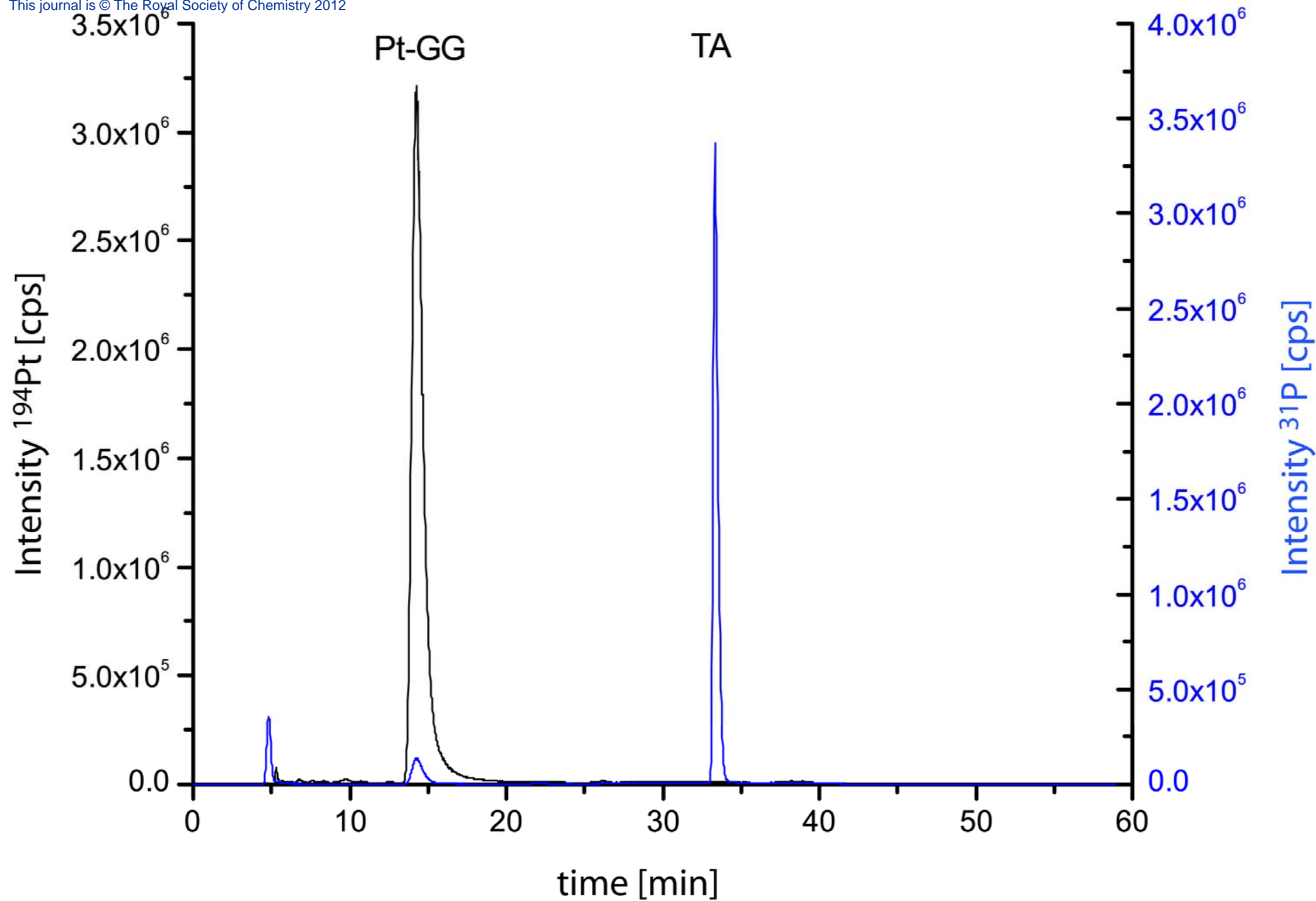
A - isotope abundance

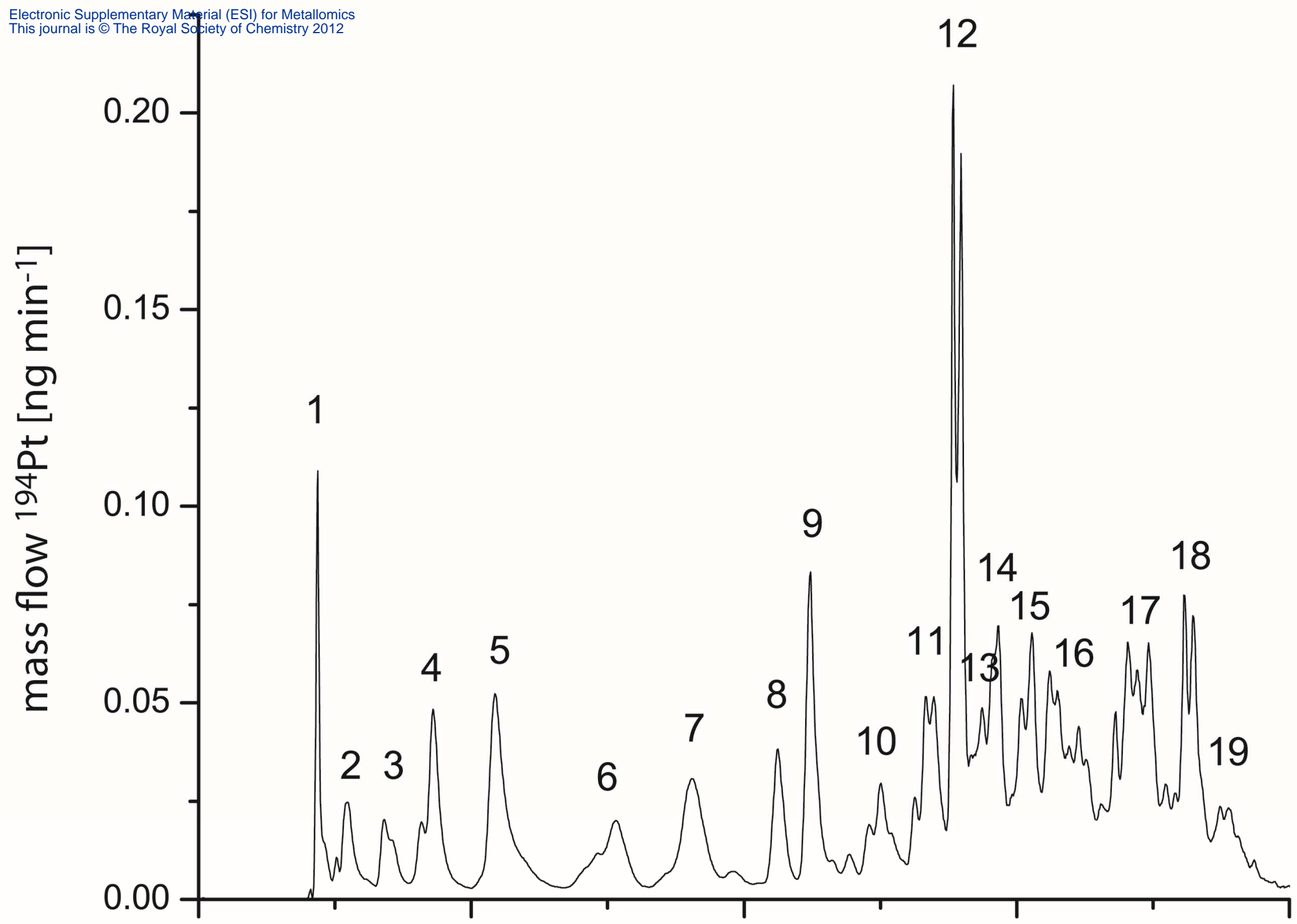
R_m - corrected isotope ratio

R_{S/Sp} - isotope ratio of sample/spike

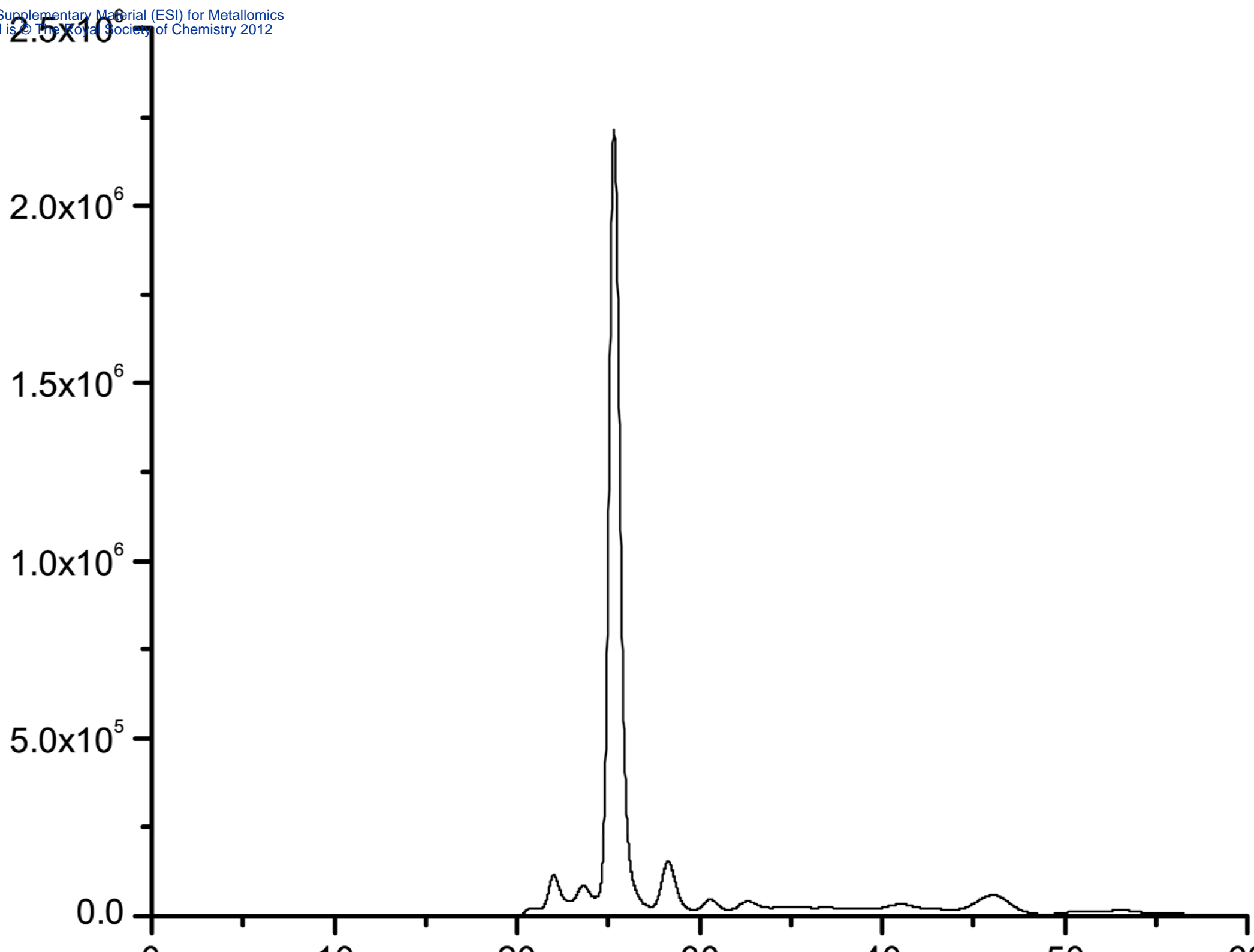
Relative intensity [%]







absorption [mAU]



Supplementary Figure 2 top

