

# On The Use of Coincidence INAA for Selenium Determination

Iberê S. Ribeiro Jr., Guilherme S. Zahn,\* and Frederico A. Genezini  
*Centro do Reator de Pesquisas, IPEN-CNEN/SP*

Adam Drescher and Sheldon Landsberger  
*University of Texas in Austin*

Instrumental Neutron Activation Analysis (INAA) is a widely used technique applied on the determination of several elements in different matrices. Selenium is one of the elements that can be studied by INAA and its determination is usually performed using one, or both, 136.01 and 264.66 keV transitions from  $^{75}\text{Se}$  radioisotope. Se determination by INAA is a case that requires special attention, mainly in virtue of three issues: (i) spectral interferences may occur due to intense gamma rays from  $^{181}\text{Hf}$  (136 keV) and  $^{182}\text{Ta}$  (264 keV); (ii) in samples with high levels of K and Na, the increased background levels due to Compton effect lead to enlargement of the detection limit; (iii) high concentration of P or any other intense high-energy beta emitter can severely impact the detection below 200–300 keV due to bremsstrahlung radiation. A possible solution for these issues is the use of gamma-gamma coincidence INAA (CINAA), as the 136 and 264 keV transitions are part of a strong gamma-gamma cascade.

In this work coincidence measurements of the decay of  $^{75}\text{Se}$  were performed to compare the results for Se obtained by conventional INAA and CINAA in biological and geological Certified Reference Materials (CRMs). The results show that the use of coincidence can drastically reduce the net/gross ratio, which implies in a reduction of the detection limit for  $^{75}\text{Se}$ ; furthermore, the results of Se concentration obtained using both methodologies are in agreement with the certified values, and both techniques provided accurate results.

---

\*Electronic address: [g Zahn@ipen.br](mailto:g Zahn@ipen.br)