

—Technical Note—

## Complementary analysis of trace elements in nail samples using instrumental neutron activation analysis and inductively coupled plasma mass spectrometry

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Instrumental neutron activation analysis (INAA) and inductively coupled plasma-mass spectrometry (ICP-MS) were applied to determine minor and trace elements in human nail samples. Validation of each method was performed by measuring NIES No. 5 Human Hair certified reference material. Good agreements were observed between certified and measured values for these methods. Nail samples collected from 18 healthy volunteers were washed, dried and cut into small pieces. The samples were divided into two portions, one of which was analyzed by INAA and the other by ICP-MS. In INAA, Na, Mg, Al, Cl, K, Ca, V, Mn and Cu were recognized and the concentrations of these elements were calculated. On the other hand, peaks of Cu, Zn, Sr, Ag, Sn, Sb, Ba, Ce Hg and Pb were observed in the spectrum by ICP-MS. Copper, Zn, Sr, Ag and Pb were determined by ICP-MS because these elements showed sufficiently high intensity without spectrum interference. Nine and five elements were determined by INAA and ICP-MS. Copper was determined by both methods, and good correlation was observed. Combination of INAA and ICP-MS has an advantage to provide more information of elemental contents for nail samples if more than only one of the two methods is employed.

**Key words:** Nail, ICP-MS, INAA

### Introduction

Determination of inorganic elements in biological samples is important from the viewpoint of nutritional status or criminal investigation, because elemental concentrations in these samples reflect the intake of biologically essential or toxic elements. Several studies have

been performed for this purpose using atomic absorption spectrometry<sup>1-3)</sup>, instrumental neutron activation analysis (INAA)<sup>4,5)</sup> and inductively coupled plasma-mass spectrometry (ICP-MS)<sup>6-10)</sup>. Among these methods, INAA has advantages of no complicated pretreatment and nondestructive during analysis. The application of this method has been spread for