

LC/ESI-MS Study of the structure of Germanium sesquioxide (Ge-132) in aqueous solution

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Organogermanium compounds have elicited increasing interest in recent years: They are becoming more and more popular as medication or nutritional additive due to their proven or assumed beneficial effects to human health. They are said to act as effective chemopreventive agents against certain forms of cancer or autoimmune diseases such as AIDS [1,2]. At the same time, critical reports warn against the uncontrolled use of organogermanium compounds as nutritional additives [3,4]. These contradictory reports call for effective analytical methods for the monitoring of organogermanium compounds contents in nutritional additives.

Only few methods are reported for the analysis of organogermanium compounds, and in particular the most commonly used Germanium sesquioxide or Ge-132. These rely either on total element determination, or on the element specific (or even unspecific) detection of the organogermanium after chromatographic separation [5,6]. This leaves the true nature of the Germanium sesquioxide in aqueous solution unrevealed.

For this reason, an LC-electrospray-MS study was undertaken to detect the structure of the Germanium species actually present in aqueous solutions of Germanium sesquioxide. Measurements were performed in direct infusion mode to avoid loss of Ge species on the chromatographic column with negative ion electrospray-MS detection. Spectra of Ge species are highly depending on the measurement conditions. They typically feature an intense molecular peak at low fragmentor voltage which is accompanied by several other signals. These signal clusters – easily identifiable as Ge-containing due to the characteristic isotopic fingerprint of Ge – are found both at higher masses, indicating the presence of (intra-/intermolecular) condensation products and at lower masses (from characteristic fragments). LC-ESI/MS provides thus valuable information on the form of Ge species actually present in aqueous solution. In addition to this, LC-ESI/MS can also be used to study the complexation of Ge sesquioxide by low-molecular weight organic compounds. This may be an important step in the elucidation of possible action mechanisms of Ge-132 in the human body.

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