

Determination of fluorine species in a rice sample affected by the accidental release of anhydrous hydrofluoric acid using XPS and GC/MS

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Highly corrosive anhydrous hydrofluoric acid (AHF) was accidentally released from a chemical plant positioned in the Gumi city, Korea on Sep. 27, 2012 [1]. Most of local citizens have been concerned about the long-term toxic effects by the fluorine (F) accumulation. In an effort to provide the useful information for assessing reliable risk of a rice (i.e., a crop mainly cultivated in the sampling area) to residents, total F contents in rice samples collected from the area directly affected by the AHF release accident and the control area were determined using the alkali fusion method [2]. Furthermore, X-ray photoelectron spectroscopy (XPS) and gas chromatography coupled with mass spectrometry (GC/MS) were concurrently used to investigate the F species in the rice sample.

It is noteworthy that the F concentration level of the rice sample grown in the control area was smaller by one order of magnitude than that of the rice sample collected from the affected area. In the meantime, a majority of F species existed in the rice sample was expected to have the C-F bond according to the binding energy shift from the XPS analysis. To support this fact, the GC/MS analysis following the methanol extraction with the ultrasonication was performed and 1-fluorododecane ($\text{CH}_3(\text{CH}_2)_{11}\text{F}$) was found. It has been recognized to have relative high toxicity to yeast compared to other F compounds previously reported [3]. Consequently, the urgent requirement of the extensive survey of the studied area should be emphasized.

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