Summary of Invention

Technical Problem

[0005]

In the case where the concentration of fluorine gas contained in a halogen fluoride-containing gas is measured by ultraviolet spectroscopy, since the halogen fluoride absorbs mainly light of wavelengths of less than 250 nm, part of the halogen fluoride is photolyzed, and fluorine molecules or fluorine radicals are generated. Hence, there has been a problem that, when measuring the concentration of fluorine gas in a halogen fluoride, measurement errors occur because of fluorine or fluorine radicals generated by photolysis.

[0006]

Embodiments of the present invention provide a high-accuracy measurement method that, in the measurement of the concentration of fluorine gas contained in a halogen fluoride-containing gas using an ultraviolet spectrophotometer, reduces the amount of measurement errors caused by for example fluorine gas generated by photolysis of the halogen fluoride.

Solution to Problem

[0007]

The present inventor and others conducted extensive studies in order to solve the issue mentioned above, and have

found out that, when measuring the concentration of fluorine gas contained in a halogen fluoride-containing gas by irradiating ultraviolet light, high-accuracy measurement can be made by suppressing irradiation with ultraviolet light of wavelengths of less than 250 nm and thus have completed the present invention. An aspect and embodiments of the present invention are defined below.

[0008]

According to an aspect of the present invention, there is provided a method for measuring a concentration of fluorine gas, the method including irradiating a halogen fluoride-containing gas with ultraviolet light in which a ratio (W_X/W_F) of a maximum value (W_X) of ultraviolet light intensity in a wavelength region of less than 250 nm with respect to an ultraviolet light intensity (W_F) at a wavelength of 285 nm is 1/10 or less, and measuring an absorbance at a wavelength of 285 nm to obtain a concentration of fluorine gas contained in the halogen fluoride-containing gas.

An embodiment of the above method for measuring a concentration of fluorine gas use a means for suppressing irradiation with ultraviolet light of wavelengths of less than 250 nm, the halogen fluoride-containing gas is irradiated with ultraviolet light of wavelengths of not less than 250 nm from a light source.

In an embodiment of the above method for measuring a concentration of fluorine gas, the means is to irradiate the ultraviolet light irradiated from the light source to the halogen fluoride-containing gas via a filter that blocks at least 50% of the ultraviolet light with a wavelength of less than 250 nm and transmits at least 90% of the ultraviolet light with a wavelength of 280-290 nm.

In an embodiment of the above method for measuring a concentration of fluorine gas, the halogen fluoride is one kind of gas selected from the group consisting of chlorine trifluoride, bromine pentafluoride, iodine heptafluoride, bromine trifluoride, and iodine pentafluoride.

In an embodiment of the above method for measuring a concentration of fluorine gas, the halogen fluoride is iodine heptafluoride.

In an embodiment of the above method for measuring a concentration of fluorine gas, the halogen fluoride is bromine pentafluoride, and the maximum value (W_X) of ultraviolet light intensity in the wavelength region of less than 250 nm is a maximum value of ultraviolet light intensity in a wavelength region of less than 225 nm.

In an embodiment of the above method for measuring a concentration of fluorine gas, the halogen fluoride is chlorine trifluoride, and the maximum value (W_X) of ultraviolet light intensity in the wavelength region of less

than 250 nm is a maximum value of ultraviolet light intensity in a wavelength region of less than 215 nm.

In an embodiment of the above method for measuring a concentration of fluorine gas, an absorption spectrum measured by irradiating a reference gas with the ultraviolet light is subtracted from an absorption spectrum measured by irradiating the halogen fluoride-containing gas with the ultraviolet light, and the concentration of fluorine gas is obtained from an absorbance at a wavelength of 285 nm of an obtained absorption spectrum.

Advantageous Effects of Invention

[0009]

According to embodiments of the present invention, high-accuracy measurement can be made for the concentration of fluorine gas contained in a halogen fluoride-containing gas.

Brief Description of Drawings

[0010]

[Fig. 1] Fig. 1 is a schematic diagram of an example of an analysis apparatus used for measurement of the concentration