

## Fluorimetric Determination of Hafnium in the Presence of Zirconium

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THE determination of small amounts of hafnium in the presence of appreciably larger amounts of zirconium has always been difficult because of the chemical similarity of the two elements. Hence, very few reliable analytical methods are available. The only chemical procedures in which hafnium gives a response under conditions where zirconium is inert involved the chromogenic reaction with Xylenol Orange<sup>1</sup> or quercetin,<sup>2</sup> in which the zirconium complex is bleached by hydrogen peroxide.

Quercetin has also been used for the fluorimetric determination of zirconium<sup>3</sup> in 80% ethanol, 2.4M in hydrochloric acid. The fluorescence, however, was shown to decrease, both with increasing acidity and decreasing ethanol concentration. We have found that in 9M-perchloric acid, containing 2.5% ethanol, zirconium does not form a fluorescent complex with quercetin, whereas hafnium

gives on intensely fluorescent species [ $\lambda$  (excitation) 340 nm.,  $\lambda$  (emission) 505 nm.]. When *ca.*  $1.5 \times 10^{-5}$ M-reagent is used, 1 to 20  $\mu$ g. of hafnium gives a linear calibration graph, unaffected by at least five times as much zirconium. Even mg. amounts of zirconium only slightly increase the fluorescence, and it is a simple matter to compensate for the increase. Thus the use of quercetin under these conditions provides the first sensitive fluorimetric method for the determination of hafnium in the presence of an appreciable excess of zirconium.

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