

A STUDY OF ZIRCONIUM AND HAFNIUM COMPLEXES WITH PYROZALLONE
DERIVATIVES AND THEIR USE IN THE ANALYSIS

M. I. Shtokalo, E. E. Kostenko, M. S. Ostrovskaya, V. L. Ryzhenko
Technological Institute for Food Industry, Kiev, USSR

Complex compounds of Zirconium and Hafnium with pyroallone-diantipyrilmethane (DAM) and diantipyrilpropilmethane (DAPM) derivatives were studied by means of a metal-indicator method. Complex formation of $Zr(DAM)_2^{4+}$ and $Zr(DAM)_3^{4+}$ with instability constants of $3.1 \cdot 10^{-12}$ and $1.2 \cdot 10^{-17}$ and $Zr(DAPM)_2^{4+}$ and $Zr(DAPM)_3^{4+}$ with instability constants - $2.6 \cdot 10^{-13}$ and $1.9 \cdot 10^{-9}$, respectively, was determined by means of a balance shift method with the use of a metallochrome indicator xylene orange (XO). Complex formation of a Hafnium ion with DAM and DAPM was studied in a similar way. The composition and Strength of the compounds being studied were determined. DAM forms a complex with Hafnium $Hf(DAM)_3^{4+}$ with instability constant of $1.2 \cdot 10^{-15}$. Instability constants of DAPM and Hafnium complexes $Hf(DAPM)_2^{4+}$ and $Hf(DAM)_2^{4+}$ will be $1.5 \cdot 10^{-8}$ and $1.2 \cdot 10^{-12}$, respectively. Tests were conducted under different concentration conditions. It is found that Zirconium forms stronger compounds with the above reagents than Hafnium, this being in accordance with literary data about the stability of other compounds of these metals.

On the basis of the above results methods of determination of minor quantities of Zirconium and Hafnium were developed. Thus Zirconium complex with DAPM was used for extraction-photometric Zirconium determination in the form of its complex compound with diantipyrilpropilmethane and rhodanide along with the subsequent arsenase III-introduction into an organic phase in the medium of 2N HCl. The method is characterized by high sensitivity ($\epsilon = 1 \cdot 10^5$). In addition an extraction-photometric method of Hafnium determination in the form of its compound with bromopyrogallie red rhodanide and diantipyrilmethane was developed.