



Derivative Spectrophotometric Determination of Neodymium (Nd) in rare Earth concentrates using 2-Hydroxymethyl-5-hydroxy- γ -pyrone

E. M. El Desouky

Nuclear Materials Authority, El Maadi, Cairo, **EGYPT**
Email: thebesdental@gmail.com

Accepted on 4th September, 2021

This Paper is dedicated to Journal of Applicable Chemistry during first Decadal Publication Celebrations

ABSTRACT

Utilizing third derivative spectrophotometry, a sensitive and selective spectrophotometric technique using 2-Hydroxymethyl-5-hydroxy- γ -pyrone was investigated for the detection of neodymium (Nd) from rare earth concentrates (xenotime and monazite concentrates). The complex of neodymium (Nd) with 2-Hydroxymethyl-5-hydroxy- γ -pyrone (Koj) was studied in acidic and alkaline solutions (in the presence of cationic surfactant). The effect of different factors and reaction circumstances on the complex formation was studied. The calibration curve was linear for neodymium concentrations of 1 to 100 $\mu\text{g mL}^{-1}$. After five consecutive measurements, the relative standard deviation for determining 1 $\mu\text{g mL}^{-1}$ neodymium was determined to be 1.5. The method has been applied to Nd determination from xenotime and monazite concentrates, and the acquired findings were found to be highly equivalent to those obtained using traditional techniques. The Nd determination from xenotime and monazite concentrates had percentage errors of 4.48 and 3.4 percent, respectively. The molar absorptivity of the conventional and third derivative spectrum was 0.12×10^3 and $0.625 \times 10^2 \text{ M}^{-1} \text{ cm}^{-1}$, respectively. The detection limit of the present method was $1 \mu\text{g mL}^{-1}$.

Highlights

- Third-derivative spectrum for the determination of neodymium complex with Koj in the presence of CPC.
- The effect of different factors and reaction circumstances on the complex formation was studied.
- The method was highly selective for measuring of neodymium in rare earth concentrates in the presence of other REEs.
- The calibration curve was linear for neodymium concentrations of $1 \mu\text{g mL}^{-1}$ to $100 \mu\text{g mL}^{-1}$.
- The relative standard deviation for determining $1 \mu\text{g mL}^{-1}$ neodymium was determined to be 1.5.
- The molar absorptivity of the conventional and third derivative spectrum was 0.12×10^3 and $0.625 \times 10^2 \text{ M}^{-1} \text{ cm}^{-1}$, respectively.

Keywords: Derivative, Spectrophotometric determination, Neodymium, Monazite, Xenotime.