# RADIOANALYTICAL DETERMINATION OF IRON-55 AND NICKEL-63 IN ENVIRONMENTAL SAMPLES

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## INTRODUCTION:

The most conventional methods to measure Fe-55 and Ni-63 include a radiochemical isolation of both nuclides followed by its measurement using a liquid scintillation counter (LSC).

Radiochemical yield could be determined by different methods, one of them is the atomic absorption (AA).

However, the radiochemical isolation of nickel can be affected both by the presence and the quantity of interferences (Ca, Mg...) that are in the different samples when precipitating in basic medium, as most conventional radiochemical methods do. Some of these interferences affect also the measurement process.

This work propose some improvements in the method in order to solve or minimize these problems.

## OBJECTIVE:

The improvement of Fe-55 and Ni-63 sequential separation method, using AG1X8 and Ni-specific resins and measuring by LSC, in environmental samples.

## METHOD:

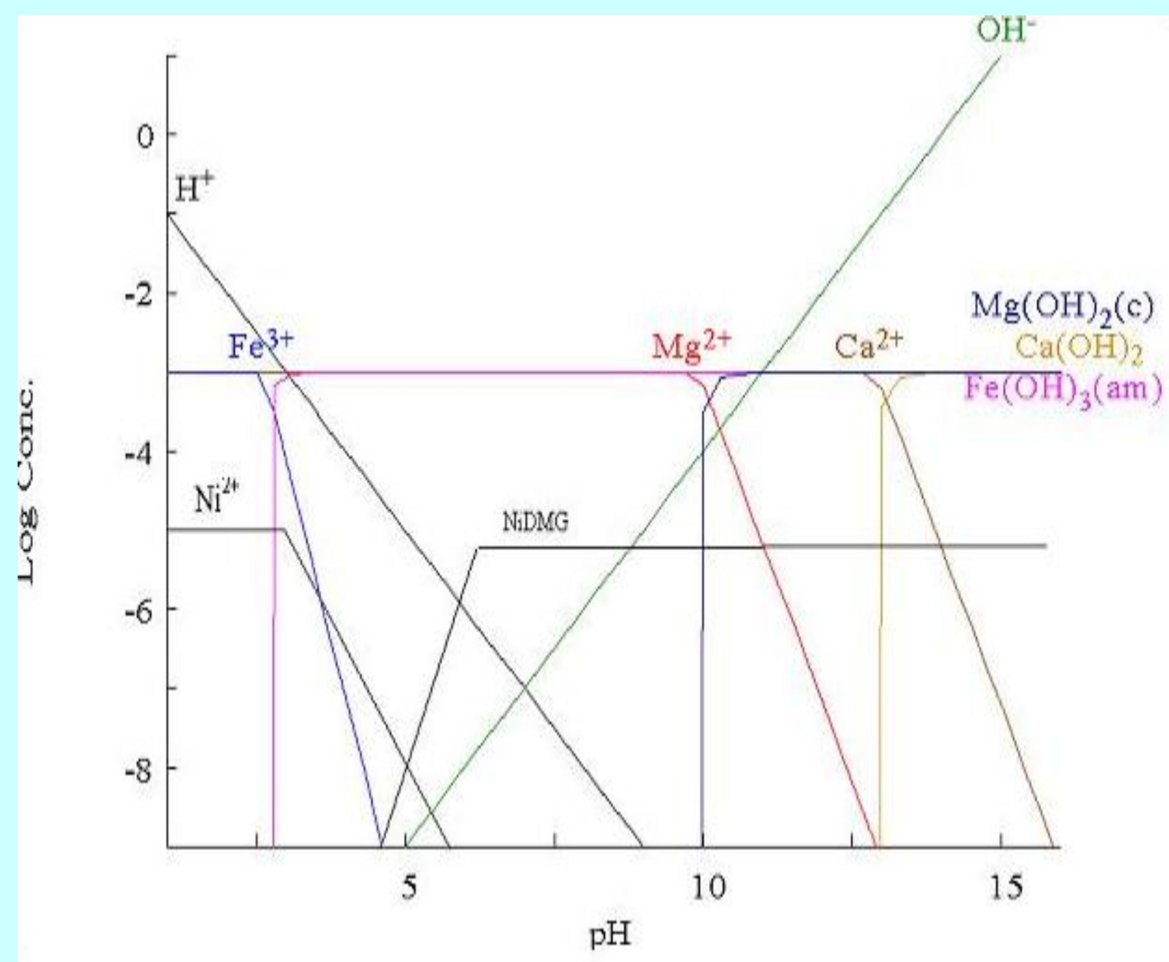
### Procedure

In order to solve this problem, two improvements are proposed:

1.- Addition of dimethylglyoxime (DMG) to the sample in order to precipitate nickel as a complex.

2.- Following the Ni, Fe and major interferents constant precipitation diagram obtained by Medusa 6.0 program, shown here, and the pKs value of DMG-Ni complex the pH of the samples is adjusted to 6.

Then, iron precipitates as hydroxide, and nickel precipitates as a complex, whereas the majority of cations remain in dissolution. This procedure eliminates the possible precipitates that appear when nickel passes through the Ni-specific resin at pH 8-9, which diminishes the radiochemical yield.




Fe + Ni + DMG pH 6 and stir.

Decant precipitate.

Dissolution and passing through resins.

### Control

Two type of samples with a high calcium content (milk and barley) and another two with a low calcium content (soil and trout) were chosen in order to analyze the improvement of the proposed changes. In them, the radiochemical separation was done by the two methods (pH 6 and basic pH) and also blanks samples were produced. From these samples radiochemical yield were obtained by atomic absorption and the blank samples were measured by LSC.

## RESULTS:

The results obtained at pH 6 are shown in the following table together with those obtained at basic pH.

| Type of sample | Chemical yield (%) (pH 6) | Chemical yield (%) (basic pH) | CPM obtained by LSC (pH 6) | CPM obtained by LSC (basic pH ) |
|---|---|---|---|---|
| Milk | 67.5 ± 1.3 | 57.6 ± 0.9 | 10.09 ± 0.12 | 11.02± 0.05 |
| Barley | 79.6 ± 1.5 | 37.7 ± 0.2 | 9.86 ± 0.23 | 10.72 ± 0.24 |
| Trout | 87.9 ± 1.7 | 87.9 ± 1.4 | 9.46 ± 0.23 | 10.84 ± 0.25 |
| Soil | 82.6 ± 0.9 | 88.1 ± 0.5 | 10.09 ± 0.11 | 9.71 ± 0.10 |

The low yield obtained at basic pH in the measurement ok milk and barley is due to the appearance of a precipitate when the sample passes through the Ni-resin at pH 8-9. In the case of the milk, about 20% of the nickel is retained in the precipitate.

## CONCLUSION

The precipitation of Ni together with dimethylglyoxime at pH 6 avoid the presence of hydroxides that can interfere in the separation. These changes allow the improvement of the radiochemical yield, that becomes higher in samples with high Ca contents. Also the blank samples measured by LSC spectrometry have lower counting rate values.