TREATMENT OF WASTE FROM ATOMIC EMISSION SPECTROMETRIC TECHNIQUES AND REUSE IN UNDERGRADUATE LAB CLASSES FOR QUALITATIVE ANALYSIS


*Departamento de Química Analítica e Físico-Química, Universidade Federal do Ceará, Campus do Pici, 60451-970 Fortaleza – CE, Brasil

*Instituto Federal de Educação do Rio Grande do Norte, Campus Nova Cruz, 59215-000 Nova Cruz – RN, Brasil

1.0 g of the solid waste residues

- **AP**
  - Extraction with 2.0 mL of 37% w w⁻¹ HCl
  - Heat in a water bath for 2 min and centrifuge
  - Supernatant: add 5 drops of 0.2 mol L⁻¹ (NH₄)₂C₂H₃O₂, 3 drops of 15 mol L⁻¹ NH₃ and 4 drops of alumnum (C₂₂H₂₆N₅O₃)
  - Red gelatinous precipitat

- **Ca**
  - Add 1 drop of 15 mol L⁻¹ NH₄ and centrifuge
  - Supernatant: Add 5 drops of triethanolamine and 10 drops of 1 mol L⁻¹ (NH₄)₂SO₄ heating and centrifuge
  - White Precipitat

- **Fe**
  - Extraction with 2 mL of water and centrifuge
  - Heat in water bath for 2 min and centrifuge
  - Add 5 drops of 37% w w⁻¹ HCl
  - Supernatant: Add 5 drops of 0.2 mol L⁻¹ (NH₄)₂C₂O₄
  - Heat in a water bath for 2 min centrifuge
  - Red Solution

- **Pb**
  - Extraction with 2 mL of 68% w w⁻¹ HNO₃
  - Heat in water bath for 2 min and centrifuge
  - Add 1 drop of 6 mol L⁻¹ CH₃COOH and 5 drops 2 mol L⁻¹ K₂Cr₂O₇
  - Heat in water bath for 2 min and centrifuge
  - Yellow Precipitat

Figure 1S. Identification of cations in solid residue obtained from ICP OES waste treatment

*e-mail: wladianamatos@ufc.br
QUESTIONNAIRE ABOUT CATION ANALYSIS IN REAL SAMPLE

About first step (01) of the analysis:

01) About the ability to observe the formation of red gelatinous precipitate at the end of the first step of the procedure? (1- Extremely difficult, 2- Poor, 3- Good, 4- Very good, 5- Excellent)
02) About the level of difficulty in performing the determination of the cation described in the first step of the procedure? (1- Very difficult; 2- Difficult; 3- Average; 4- Easy; 5- Very Easy)
   Describe the main difficulties faced during the experiments in this first step (01) of the analysis:
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________

About second step (02) of the analysis:

03) About the ability to observe the formation of the precipitate when you added (NH₄)₂SO₄? (1- Extremely difficult, 2- Poor, 3- Good, 4- Very good, 5- Excellent)
04) About the level of difficulty in performing the determination of the second step (02) of the analysis? (1- Very difficult; 2- Difficult; 3- Average; 4- Easy; 5- Very Easy)
   Describe the main difficulties faced during the experiments in this second step (02) of the analysis:
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________

About third step (03) of the analysis:

05) About the ability to observe the formation of the blood-red solution after the addition of (NH₄)SCN? (1- Extremely difficult, 2- Poor, 3- Good, 4- Very good, 5- Excellent)
06) About the level of difficulty in performing the analysis described on the third step (03)? (1- Very difficult; 2- Difficult; 3- Average; 4- Easy; 5- Very Easy)
   Describe the main difficulties faced during the experiments in this third step (03) of the analysis:
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________

About fourth step (04) of the analysis:

07) About the ability to observe the formation of the yellow precipitate after the addition of K₂CrO₄? (1- Extremely difficult, 2- Poor, 3- Good, 4- Very good, 5- Excellent)
08) About the level of difficulty in performing the analysis described in the fourth step (04)? (1- Very difficult; 2- Difficult; 3- Average; 4- Easy; 5- Very Easy)
   Describe the main difficulties faced during the experiments in this fourth step (04) of the analysis:
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________