

Quality control test for iron, vitamin A and C, and folic acid

QA/QC Workshop on flour fortification – Makerere University – 26/05/2016

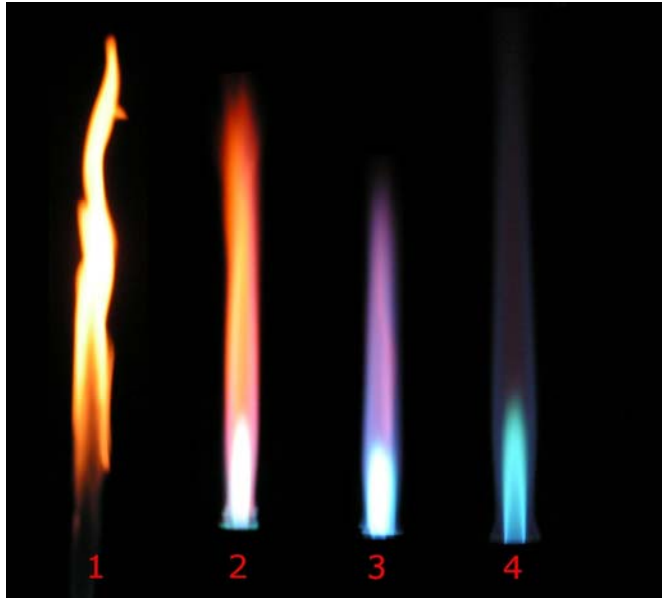
WHO HAS ALREADY HEARD OF AES, AAS OR ICP?

WHO IS ABLE TO EXPLAIN THESE TECHNIQUES?

WHO HAS A LIGHTER WITH HIM/HER (*PREFERABLY WORKING*)



QA/QC MEETING ON FLOUR FORTIFICATION

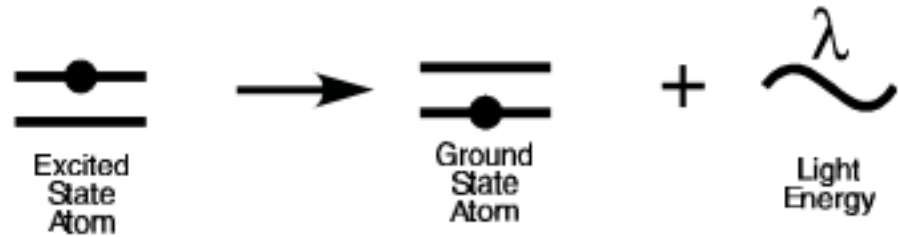


1 = NO OXYGEN ADDED; 4 = 100 % OF OXYGEN

EXCITATION



DECAY

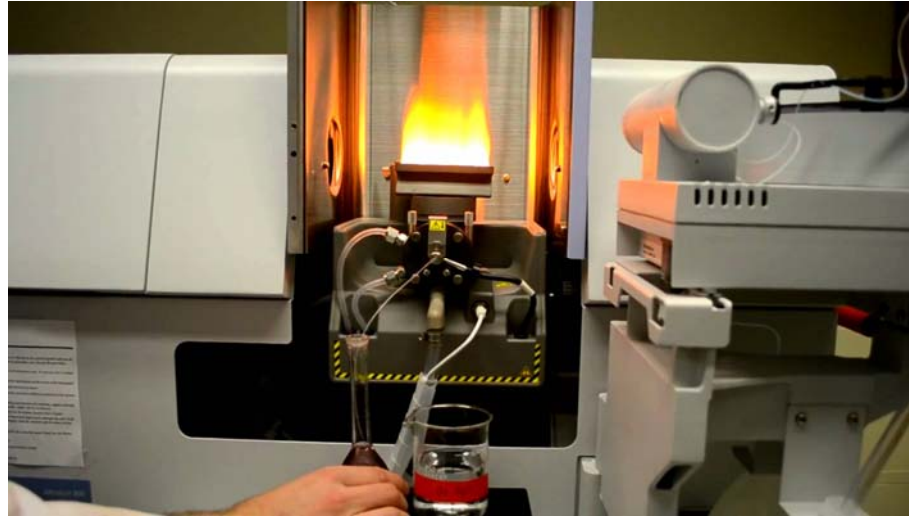


AES = Atomic **E**mision Spectrophotometry AAS = Atomic **A**bsorption Spectrophotometry



QA/QC MEETING ON FLOUR FORTIFICATION

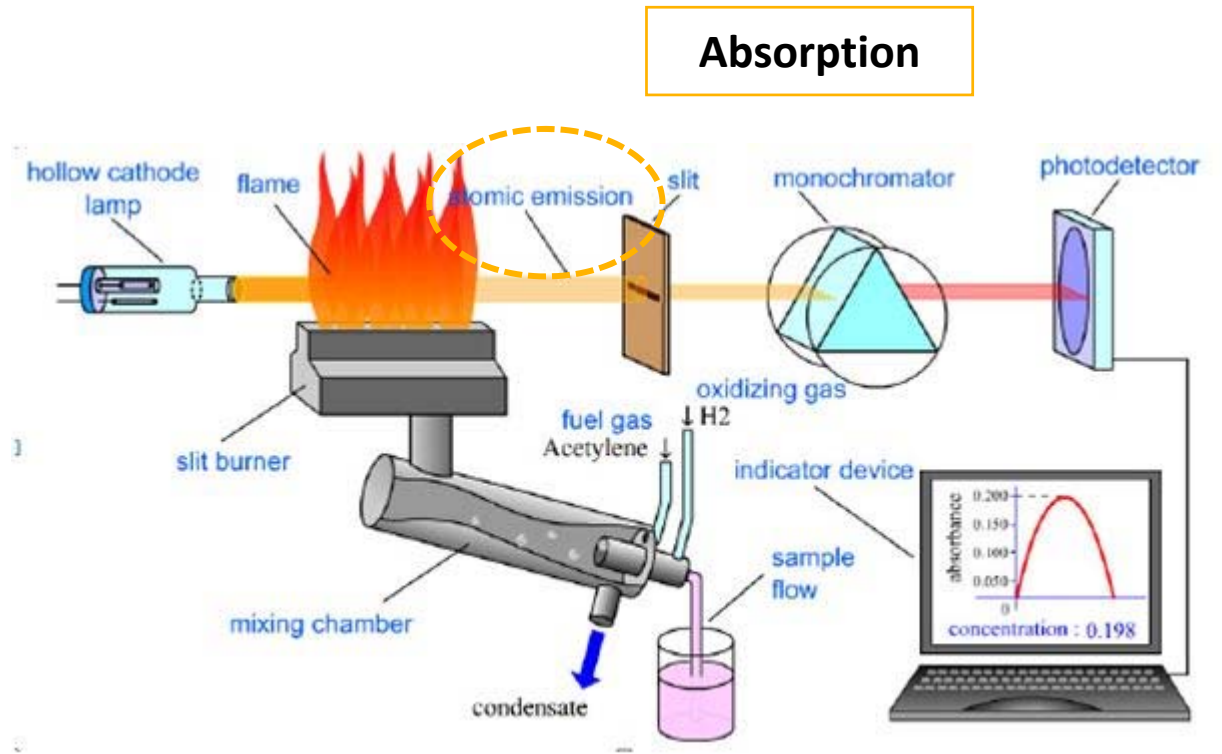
Atomic **Absorption** Spectrophotometry



SETUP OF AN ATOMIC ABSORPTION SPECTROPHOTOMETER



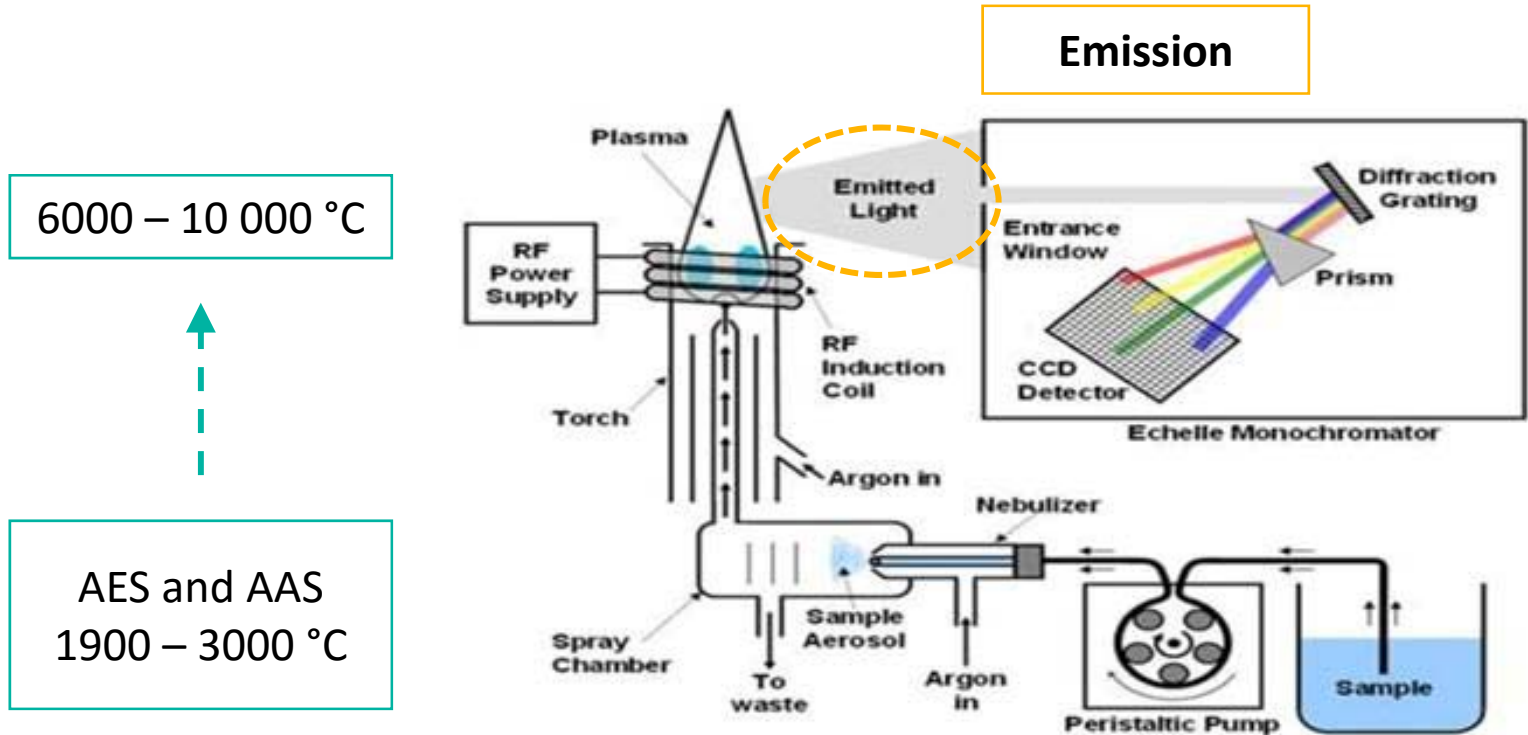
Atomic Absorption Spectrophotometry



PRINCIPLE BEHIND ATOMIC ABSORPTION SPECTROPHOTOMETRY



Inductively Coupled Plasma (ICP)



PRINCIPLE BEHIND ICP-OPTICAL EMISSION SPECTROPHOTOMETRY



QA/QC MEETING ON FLOUR FORTIFICATION

ADVANTAGES

- Many mineral components can be determined in one single run (Fe, Br, Ca, Cu, Mg, Mn, N, K, S, Zn,...)
- Relatively low cost per run
- Sample preparation is not that complex or time consuming
- Accuracy of ± 7 to ± 30 %

DISADVANTAGES

- Device and maintenance costs are very high (> 50000 USD + 1000 USD/year)
- Need for a trained laboratory technician
- Requires standard curve and frequent (elaborate) calibration should be performed
- Not suitable for routine analysis



Iron spot test

1. Solution A: Thiocyanate / HCl
2. Solution B: hydroperoxide

Ferrous fumarate = Fe^{2+}

$\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$

$\text{Fe}^{3+} + \text{thiocyanate} = \text{red dot}$

$\text{NaFeEDTA} = \text{Fe}^{3+}$

$\text{Fe}^{3+} + \text{thiocyanate} = \text{red dot}$



Low
concentration



Higher
concentration

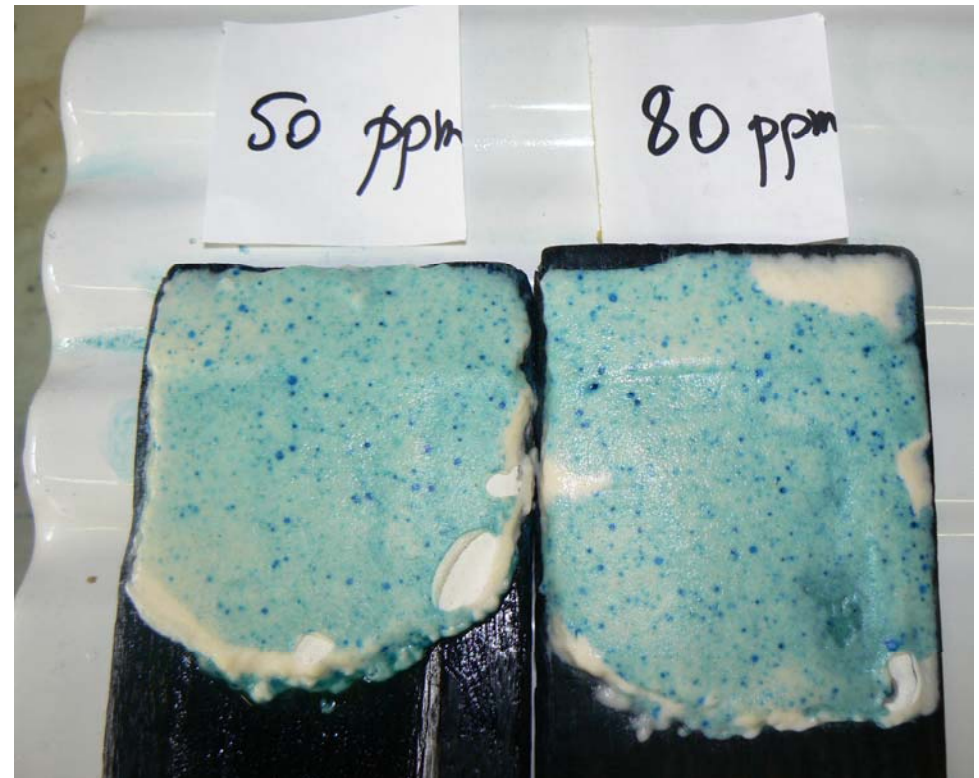


Vitamin C – Ascorbic acid

1. Solution A: Ferric sulphate and sulphuric acid
2. Solution B: Potassium ferricyanide

Oxidation-reduction reaction leads to the formation of a blue color complex
➔ Semi-quantitative

QC check to look if flour improvers are added (correctly). Ascorbic acid is no flour fortificant



Vitamin A and B9 (Folic Acid)

HPLC is the most precise way to quantitatively determine concentrations of vitamin A and folic acid

