

VA APPLICATION NOTE V-219

Sn(II) in radiopharmaceuticals

Polarographic determination of stannous tin in sodium pertechnetate ^{99m}Tc injection kits

^{99m}Tc radiopharmaceuticals are widely used in medical imaging diagnostic procedures. They can help to diagnose a large number of diseases affecting the bones and major organs of the body such as the heart, brain, liver, kidney, and thyroid.

^{99m}Tc radiopharmaceuticals are usually prepared from so-called «cold kits». A cold kit consists of the ligand to which ^{99m}Tc is complexed, a reducing agent, a buffer, stabilizers, and further ingredients. Sn(II) is a typical reducing agent. It reduces the Tc(VII) that is added to the cold kit to a lower oxidation state which then forms the stable organic complex.

For quality control, the Sn(II) content has to be determined in the kit vial. Sn(II) can be selectively determined using differential pulse polarography. The freeze-dried content of the vial is dissolved in diluted nitric acid prior to determination.

Polarography is a straightforward, sensitive, selective, and interference-free method for the determination of mg/L levels of Sn(II) in radiopharmaceuticals.

SAMPLE

Cold kit for preparation of sodium pertechnetate (^{99m}Tc) injection.

EXPERIMENTAL

After dissolving and diluting the sample with nitric acid supporting electrolyte, the polarographic determination of Sn(II) is carried out on the 884 Professional VA with the Multi-Mode Electrode pro as working electrode using the parameters listed in Table 1. The concentration of Sn(II) is determined by three additions of Sn(II) standard addition solution.



Figure 1. 884 Professional VA

ELECTRODES

- Working electrode: Multi-Mode Electrode pro with standard glass capillaries
- Reference electrode: Ag/AgCl/KCl (3 mol/L) reference electrode with electrolyte vessel. Bridge electrolyte: KCl (3 mol/L)
- Auxiliary electrode: Platinum rod electrode

Table 1. Parameters

Parameter	Setting
Working electrode	DME
Mode	DP – Differential Pulse
Start potential	-0.22 V
End potential	-0.66 V
Peak potential Sn(II)	-0.35 V

RESULTS

The determination of Sn(II) in cold kits for sodium pertechnetate (^{99m}Tc) injection can be carried out in a simple and straightforward manner. The method is selective and free of interferences. It is suitable for concentrations in the mg/L range.

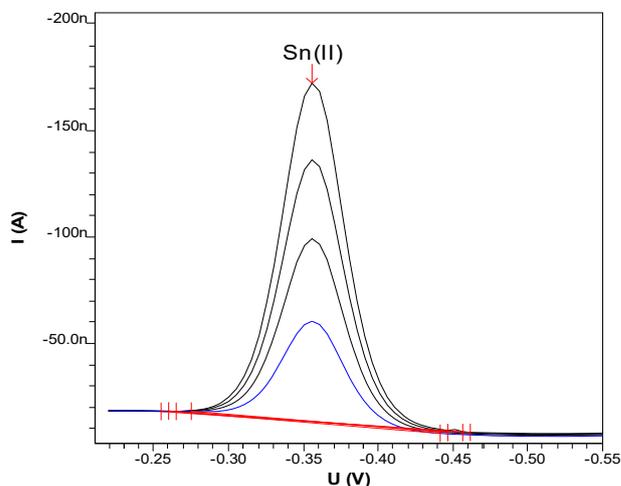


Figure 2. Determination of Sn(II) in a ^{99m}Tc injection preparation kit with 3 standard additions.

Table 2. Result

Sample	Concentration [mg/L]
^{99m}Tc injection preparation kit	22.1

REFERENCES

International Atomic Energy Agency, Technical Report No. 466 «Technetium-99m Radiopharmaceuticals: Manufacture of Kits», Vienna, 2008

Zolle, Ilse (Ed.), Technetium-99m Pharmaceuticals - Preparation and Quality Control in Nuclear Medicine, Springer, 2007

Analytes: Tin
Matrix: Pharmaceutical drugs; Pharmaceutical solutions
Method: Voltammetry, Polarography
Industry: Pharmaceutical