

# **Arsine-Induced Formation of Silver Nanoparticles in Micellar Medium. Application to Spectrophotometric Determination of Arsenic**

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A new spectrophotometric method for the determination of arsenic at a  $\mu\text{g g}^{-1}$  level has been developed. The method was based on the formation of silver nanoparticles in anionic micellar medium and consecutive reduction of Ag(I) by arsine ( $\text{AsH}_3$ ) generated from arsenic present in water. The magnitude of absorbance of yellow-coloured silver sol measured at  $\lambda_{\text{max}} = 395 \text{ nm}$  was proportional to arsenic concentration in the sample. Linear dynamic range (LDR) for arsenic determination was  $0\text{--}0.5 \mu\text{g g}^{-1}$  ( $R^2 = 0.998$ ). Molar absorptivity equalled  $4.98 \times 10^3 \text{ L mol}^{-1} \text{ cm}^{-1}$ , and Sandell's sensitivity was  $1.50 \times 10^{-2} \mu\text{g cm}^{-2}$ . Formation of silver sol in the sample containing  $0.02 \mu\text{g g}^{-1}$  arsenic could be easily detected visually. Detection limit was improved after removal of water from the sample, as well as when sample solution was preconcentrated. At 95% confidence level the determined concentration of arsenic was  $0.18 \pm 0.01 \mu\text{g g}^{-1}$  (for 10 replicate analyses), compared to the true value of  $0.2 \mu\text{g g}^{-1}$ . The proposed method is simple and provides reproducible results. Relative standard deviation varies within  $\pm 5\%$ . The method is insensitive to common interfering ions/materials, *i.e.*  $\text{Fe}^{2+/3+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Sb(III)}$ ,  $\text{Se(IV)}$ ,  $\text{PO}_4^{-3}$ ,  $\text{SiO}_3^{-2}$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^{-2}$ , humic acid, pesticides/herbicides (such as 2,4-D, endosulfan, atrazine), *etc.*