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# Selenium

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For water and wastewater

Diaminobenzidine Method

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## Introduction

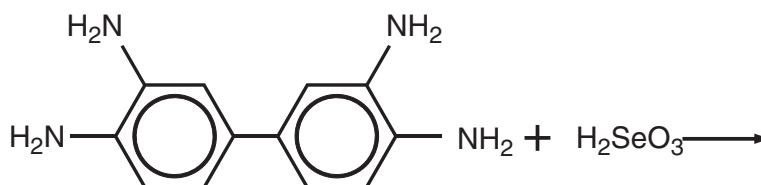
Selenium levels in natural waters seldom exceed 0.01 mg/L and concentrations greater than 0.50 mg/L are rare. The appearance of selenium in natural waters may be due to seepage from soils containing selenium or intrusion of industrial wastes.

Selenium, very toxic to man and animals, exhibits properties similar to those of arsenic. Selenium is suspected of causing dental caries and of being carcinogenic, but trace amounts also have been found essential to maintain normal body metabolism. For this reason, a maximum concentration level in drinking water has been established by the USEPA in accordance with the Safe Drinking Water Act.

The Diaminobenzidine Extraction Method uses diaminobenzidine indicator, which develops a yellow color with selenium. This method measures only the tetravalent selenium ( $\text{Se}^{4+}$ ). Selenium present as  $\text{Se}^{2+}$  and  $\text{Se}^{6+}$  is not detected unless the sample is first distilled.

## Chemical reactions

In the test for selenium, an EDTA masking agent is first added to the sample to remove interferences such as iron. The addition of formic acid adjusts the sample to an optimum pH range of 1–2. Under these conditions, diaminobenzidine reacts with all selenium present in the  $\text{Se}^{4+}$  form to give a yellow-colored piaszelenol complex. (Selenium existing in the selenate form is not determined by this method.) The sample is then buffered to a pH of 10–11, where the piaszelenol complex can be extracted into toluene. Measurement of the color intensity directly indicates the amount of  $\text{Se}^{4+}$  in the sample.



Diaminobenzidine

