DETERMINATION OF LOW CONCENTRATIONS OF HYDRAZINE IN WATERS OF BOTH THE PRIMARY AND SECONDARY CIRCUITS OF NPPs WITH VVER

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A simple, sensitive and reliable method was developed for the determination of hydrazine in technological waters of NPPs. A pulverized mixture of oxalic acid and p-dimethylaminobenzaldehyde is added to a sample. As low as 1.5 µg.dm⁻³ hydrazine can be determined. The method is independent of the sample temperature. The agent is stable, readily soluble in water, and not hygroscopic.

INTRODUCTION

The effective anticorrosion protection of inner surfaces of the components of primary and secondary circuits equipment belongs to the most important issues closely connected with reliable and safe operation of nuclear power plants with VVER 440 reactors. Oxygen dissolved in water or hydroxonium ion arising in the proto-
ysis of CO₂, are electron acceptors and they thus enhance the following reaction:

\[ \text{Me} = \text{Me}^{2+} + z.e^- \]

leading to the corrosion of construction materials. Water has the same effect at high temperatures, but the reaction is rather slow at ambient temperatures¹⁻³.

One of the potential methods of protection against the corrosion of construction materials is the addition of ingredients into the water of circuits which results in the formation of corrosion-resistant substances. So, for example, residual oxygen in the waters of both the primary and secondary circuits after their thermal degassing, can be removed by adding reducing agents. Sodium sulphite, pyrogallol or hydrazine can be used for this purpose²,⁴,⁵. From all these agents, hydrazine has several advantages, since nitrogen is produced in the reaction¹,²:

\[ \text{N}_2\text{H}_4 + \text{O}_2 = \text{N}_2 + 2\text{H}_2\text{O} \]

Hydrazine, besides its use for the removal of oxygen traces from the waters of both circuits, is used, first of all, to reduce the solubility of copper from brass in the secondary circuit of VVER 440, and thus inhibiting the formation of deposits on heat exchanging surfaces⁶. Hydrazine is used for the conservation of inner surfaces of both circuits during shut-downs of these facilities, too.

Nowadays the hydrazine concentration in NPP water circuits is determined by using the alcoholic acid⁷,⁸ or aqueous acid⁷,⁹ solution of p-dimethylaminobenzalde-