Reduction of nitrate to nitrite takes place when the stored energy in the form of colour centres is released during dissolution of γ-irradiated NaCl crystals in aqueous sodium nitrate solution. Various parameters like dose, amount, storage time and particle size of irradiated NaCl salt which control the yield of nitrite have been studied. Similarly, the effect of concentration of NaNO₃ and the role of precipitation on the yield of nitrite in aqueous TlNO₃ and AgNO₃ have been investigated. The energy transfer parameter has been determined as the ratio of G/NO₂⁻/ obtained by the addition of irradiated NaCl to that of direct γ-radiolysis. The data permit the evaluation of the concentration of colour centres in the irradiated NaCl crystals on the basis of the mechanism of reduction of nitrate.

INTRODUCTION

Sodium chloride crystals on exposure to ionizing radiation produce F centres and hole centres. Dissolution of such crystals in water results in the formation of hydrated electrons.
Recombination of hydrated electrons with the hole centres at the water-solid interphase during the dissolution process leads to the emission of visible light termed aqua-luminescence.

\[ \text{Cl}^- + e^-_{\text{aq}} \rightarrow [\text{Cl}^-_{\text{aq}} + h\nu /\text{AL/}] + 2\text{Cl}^-_{\text{aq}} \]

On the other hand, the dissolution of irradiated NaCl crystals in aqueous iodide, nitrate and their mixtures induces oxidation and reduction reactions, respectively. However, very little attention has been paid to various parameters which control the redox reactions. The present paper deals with the effect of dose, amount, storage time and particle size of irradiated NaCl crystals on the reduction of nitrate. It is also interesting to study the concentration variation of NaNO₃ and the effect of precipitation on the chemical yield of nitrite in aqueous TlNO₃ and AgNO₃ solutions.

**EXPERIMENTAL**

AnalaR grade polycrystalline NaCl salt was dried under an IR lamp. 2.5 g NaCl powder was sealed in a glass envelope and wrapped in black paper. This sample was irradiated to a dose of 45 kGy using a ⁶⁰Co γ-source, whose dose rate measured by a Fricke dosimeter was 3 kGy h⁻¹. The irradiated samples were kept in a desiccator for 4 h to allow the room temperature luminescence to decay completely. The dissolution of irradiated NaCl salt was carried out in a freshly prepared 10 cm³