SUMMARY OF CONTRIBUTIONS MADE IN THE PRESENT WORK

1. Fluorescence spectra of CsUO₂(NO₃)₃, Cs₂UO₂(NO₃)₄ and Rb₂UO₂(NO₃)₄ at 77°K have been studied for the first time.

2. Infrared absorption spectra of KUO₂(NO₃)₃, Cs₂UO₂(NO₃)₄, Rb₂UO₂(NO₃)₄, K₂UO₂(NO₃)₄ have also been investigated for the first time.

3. The salt, Cs₂UO₂(NO₃)₄ which was not known before has been synthesised for the first time and its identity proved.

4. It has been shown that the 'nitrate frequencies' observed in the fluorescence spectra of all the alkali uranyl nitrate double salts are due to the ONO₂ group and not the NO₃ group. This indicated co-ordinated nitrato groups in all the six salts studied.

5. Evidence obtained in the present investigations confirms that the uranium nitrate disalts have a co-ordinated nitrato group and are likely to have formulae of the type M₂UO₂(NO₃)₄ rather than MUO₂(NO₃)₃-MNO₃. In the latter case, one should have observed the NO₃ group frequencies also which is not the case.
6. An empirical relationship between the \( UO_2^{4+} \) frequencies \( \nu_1 \) and \( \nu_4 \) namely

\[
\nu_4 = c \cdot \nu_1 + d
\]

has been found from the data collected in these investigations. This relation holds good for alkali uranyl nitrate double compounds. The mean deviation of the observed values of from those calculated from the above relation is as low as \(-0.13 \text{ cm}^{-1}\).

7. A new low temperature form of a potassium uranyl nitrate salt, which is believed to be \( K_3UO_2(NO_3)_5 \) has been synthesised and its fluorescence spectrum is studied.

8. Radiation damage in uranyl nitrate salts: It has been shown that the new bands obtained in the fluorescence spectra of reactor irradiated \( CsUO_2(NO_3)_3 \) and \( RbUO_2(NO_3)_3 \) are due to \( Cs_2UO_2(NO_3)_4 \) and \( Rb_2UO_2(NO_3)_4 \) at moderate doses of radiation. From irradiation experiments conducted with sources giving individual types of radiations it has been shown that it is mostly the thermal neutron components of the reactor radiations that is responsible for the observed radiation damage. A mechanism involving the fission of the \( ^{235}U \)
nucleus has been postulated to understand the observed radiation damage in the uranyl nitrate salts.