required after other labelling methods, for example, after Wilzbach-labelling[4]. The procedure is rather rapid, requiring no special equipment, and may take place under mild conditions permitting the successful labelling even of sensitive molecules with suitably high specific activity. Activity yield is about of the same order as in the case of Wilzbach-labelling. Radioactivity was measured by the liquid scintillation technique using a Packard liquid scintillation spectrometer (model 3003).

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Pure Quadrupole Resonance Frequency Shift and Internal Stress in Gamma-ray Irradiated Sodium Chlorate

The effects of irradiation and crystalline defect on pure quadrupole resonance (PQR) have been extensively investigated[1]. Randall *et al.*[2] observed an increase of the line width and second moment after X-ray irradiation, and concluded that strain broadening is the predominant mechanism. The changes in the electric field gradient induced by an applied stress were also measured by Collins and Bloembergen[3]. Colour centres occur in sodium chlorate crystals after γ-ray irradiation. These are probably due to V centres and O_2^- centres[4,5]. Such impurities are likely to set up stresses and bring about changes in the electric field gradient. For this reason, it would be expected that a shift of the pure quadrupole resonance would occur.

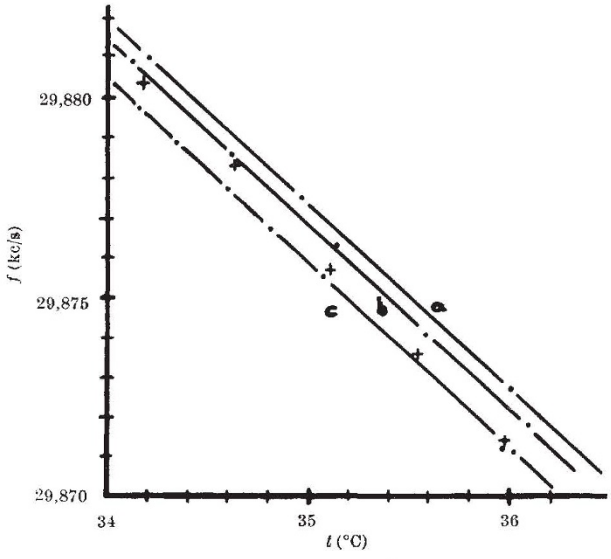

Fig. 1. Temperature dependence of PQR frequency of ^{35}Cl isotope: *a*, before; *b* and *c*, after γ-ray irradiations of $0{\cdot}9\times10^6$ and $2{\cdot}09\times10^6$ r. respectively

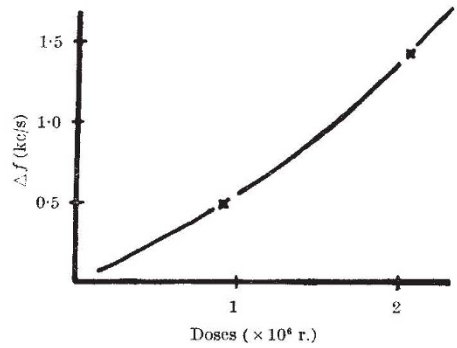

Fig. 2. PQR frequency shift of ^{35}Cl due to γ-ray irradiations

The aim of the work reported here was to measure this shift and to interpret the internal stress. The results of the preliminary measurements are shown in Fig. 1. It was necessary to eliminate the temperature effect. For that reason we made the measurements in a thermostat at about 35° C (ref. 6). In Fig. 1, *a* is for the non-irradiated sample, *b* is for the sample irradiated with γ-rays from reactor *TR*-1 (Çekmece Nüklear Research Center, Istanbul) with doses of $0{\cdot}9\times10^6$ r., and *c* gives the results after cumulative doses of $2{\cdot}09\times10^6$ r. During the measurements the temperature fluctuation was less than 0·01° C. Measurements were made with a conventional Dean-type spectrometer[7]. Frequency was measured with a Hewlett-Packard 524*C* period counter. For each point on Fig. 1 the mean square root error of frequency was about 30 c/s. In Fig. 2 PQR frequency shift is shown as a function of the irradiation dose. With these results and using theoretical analysis[3], it is possible to interpret the stress produced in sodium chlorate crystals by γ-rays. Since the piezo-electric effects are negligible[3], and since the changes in the electric field gradient may not explain the line broadening[2], the main effect should be due to strains. T^2_{3333} is very much greater than T^2_{3311}. The stress produced by rays of doses 10^6 r. in sodium chlorate crystals in the Na-Cl direction is:

$$\sigma_{33} \cong 23 \text{ kg/cm}^2\text{.Mr.}$$

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Acid Phosphatases

We have been concerned with the isolation of acid phosphatases (orthophosphoric monoester phosphohydrolases, 3.1.3.2.) in quantities sufficient for chemical studies of these enzymes. The sources chosen were: the potato, the human prostate gland and human seminal plasma. We have found that the potato is a poor source and, although the enzyme has been obtained in a form which is homogeneous to starch-gel electrophoresis and to ultracentrifugation, the method is tedious and, because of the very large purification factor involved (about 25,000), leads to a low final yield (about 10 mg from 50 kg of potatoes). The best preparation previously reported was apparently associated with a purification factor of about 1,000 (ref. 1).

Several reports of the complete purification of prostatic acid phosphatase have been made[2,3], but, seemingly, the

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