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THE NEW ISOTOPE ^{92}Ru

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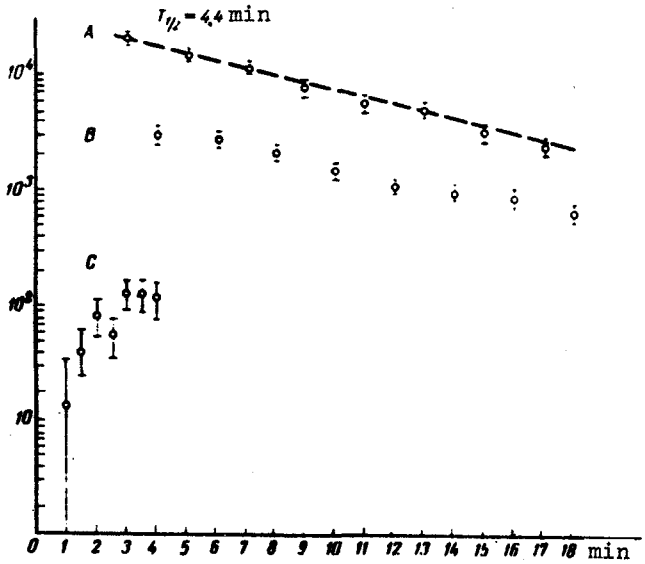
The following neutron-deficient isotopes of Ru are known at present: ^{95}Ru ($T_{1/2}$ = 1.7 hr), ^{94}Ru ($T_{1/2}$ = 57 min), and ^{93}Ru ($T_{1/2}$ = 50 sec). We have attempted to observe the isotope ^{92}Ru.

To this end, silver chloride was bombarded by 660-MeV protons of the extracted beam of the JINR synchrocyclotron. The time of bombardment was 3 - 5 min. The bombarded target was delivered within several seconds by a pneumatic conveyor system to a chemical cabinet, where the Ru and Tc fractions produced as the spallation of Ag were separated thermochromatographically. The time of chemical separation was 2.5 - 5 min. With the aid of a Ge(Li) detector with a volume of 38 cm^3 and a resolution $\sim$3.6 keV, we investigated the γ spectrum of both fractions at an energy of 661 keV. The reduction of the obtained data was by a "Minsk-2" computer used with the "katok" program [1].

Besides the lines belonging to ^{97}Ru, ^{95}Ru, and ^{94}Ru and the daughter products ^{95}Tc and ^{94}Tc, we observed in the γ spectrum of the ruthenium fraction also lines corresponding to the decay of ^{92}Tc [2]. We observed particularly distinctly γ rays with energies 148 and 1509 keV. They appeared, naturally, also in the spectrum of the γ rays of the technetium fraction.

The appearance of the ^{92}Tc lines in the γ spectrum of the ruthenium fraction can be attributed either to the decay of the heretofore unknown parent isotope ^{92}Ru or to an admixture of Tc in the ruthenium fraction. To exclude the second possibility, the spectra of the technetium and ruthenium fractions were plotted, for comparison, ten days later. The dominating role in the contribution of the technetium fraction was assumed by ^{96}Tc (4.3 days). In the ruthenium fraction we observed the lines ^{97}Ru (2.7 days) and ^{103}Ru (40 days), but no noticeable admixture of Tc was observed. Consequently, it can be regarded as proved that ^{92}Tc appears in the ruthenium fraction as a result of the decay of ^{92}Ru.

In succeeding experiments we investigated the change of the intensity of the 148-keV line of ^{92}Tc with time, in both the technetium and ruthenium fractions. The results are shown in the figure. Curve A represents the decay of 148-keV line in the technetium fraction. We see that the obtained experimental points fit well a straight line corresponding to the half-life of $T_{1/2}$ = 4.4 min, in agreement with the published data. It is obvious that the curve capable of describing the experimental points B (the decay of the same line in the ruthenium fraction) is more gently sloping, as should be the case if a parent isotope exists. In these measurements, however, the first point was obtained only 4 min after the separation of the fraction. In the next experiment where we measured again the intensity of the 148-keV line in the ruthenium fraction, we were able to obtain the first point within 1 minute after separation of the fraction (see the points C). We see here a distinct growth of the 148-keV line of ^{92}Tc in the ruthenium fraction. It is concluded on the basis of the analysis of these data that the half-life for the parent ^{92}Ru is $T_{1/2}$ = (2.5 $\pm$ 1) min.



Change of intensity of the 148-keV line of ^{92}Tc with time: A - in the technetium fraction, B and C - in the ruthenium fraction. The time marked on the abscissa axis is reckoned from the instant of termination of the chemical separation of the corresponding fractions.

In the γ spectrum of the ruthenium fraction we observed the lines 134, 202, and 260 keV, which decayed approximately with the same half-life ∿2.5 min. It can be assumed that at least some of them result from the decay ^{92}Ru → ^{92}Tc. The experiments on the identification of these lines and also on the refinement of the half-life of ^{92}Ru are being continued.

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POLARIZATION ECHO IN THE FERROELECTRIC SINGLE CRYSTAL KH_2PO_4

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An electric analog of electronic spin echo was observed at helium temperatures in single-crystal KH_2PO_4 at a frequency 10^{10} sec^{-1}. The echo responses have a high intensity, a duration on the order of 3×10^{-8} sec, and are independent of the magnetic field intensity. An analysis of the experimental data shows that the polarization echo is due to a system of localized centers having an electric dipole moment. The reversible phase relaxation of this system is due to the inhomogeneity of the local electric field in the ferroelectric. The times of longitudinal reversible transverse and irreversible transverse relaxations of these centers at helium temperatures are respectively on the order of $T_1 \sim 10^{-5}$ sec, $T_2^* \sim 10^{-8}$ sec, and $T_2 \sim 1.6 \times 10^{-6}$ sec. In [1 - 3] they reported experimental observation of cyclotron, ferromagnetic, and flexoid echo. In [4 - 6] these phenomena were described theoretically from a unified point of view as responses of a system of coherently excited quantum oscillators, and were called macroscopic echo signals. Since the excitation of the proton oscillations and vortex filaments in helium, of domains in paramagnets and ferroelectrics, tubes of self-trapped radiation in optically excited media, and of defects in crystals can be described by the same formalism, the problem