A NEW ISOTOPE Ir^{183}

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Fig. 1

Figure 1: Fig. 1

Fig. 2

Figure 2: Fig. 2

Abstract

Full Text

PHYSICS

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A NEW ISOTOPE Ir^{183}

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In separating daughter osmium from the iridium fraction formed in the spallation of gold by protons with an energy of 660 MeV, an activity with a half-life of 12 hours, belonging to Os^{183} ([1,2]), was detected. This fact indicates the formation, among the spallation products of gold, of a new neutron-deficient isotope of iridium with mass number 183. The present work is devoted to determining the half-life of Ir^{183}.

Metallic gold in an amount of ~ 0.5 g was irradiated in the internal beam of the synchrocyclotron of the Joint Institute for Nuclear Research with protons of energy 660 MeV for 0.5-1 hour. Radiochemically pure iridium from the gold spallation products was obtained by the procedure described in work ([3]). Then, from the iridium, at equal time intervals, daughter osmium was systematically separated (the accumulation time varied in different experiments from 1.5 to 4 hours). For this purpose, 20 mg of osmium in the form of Na_2OsO_4 was added to the radioactive iridium solution. OsO_4 was distilled off with hydrochloric acid and trapped in 10% NaOH. Then osmium sulfide was precipitated and ignited to the metal in a stream of hydrogen. The completeness of the separation of osmium was monitored by weighing the metallic osmium. The chemical yield was 95-98%.

Fig. 1. Decay curves of the activity of daughter osmium: *a*—4th separation, *b* —7th separation

Fig. 2. Change in the activity of daughter osmium, 9th separation

The decay of the activity of daughter osmium was measured with an end-window counter of a standard counting setup. Figure 1 gives the decay curves of the osmium activity accumulated over 1.5 hours for the 4th and 7th separations. Half-lives of 10 min, 12 hours, and 90 days were found. It is evident that the

Fig. 3

Figure 3: Fig. 3

activity due to Os^{183} constitutes a considerable fraction of the total activity of osmium. In the osmium separated 12 hours after the start of the iridium separation (9th separation, see Fig. 2), the 12-hour activity was not detected.

Fig. 3. Change in the amount of Os^{183} activity ($T = 12$ hours) as a function of the time of separation of daughter osmium: *a*—every 4 hours, *b*—every 1.5 hours

The change in the amount of activity of Os^{183} as a function of the separation time (Fig. 3) gives a half-life of Ir^{183} equal to 1 ± 0.1 h. Activity with a half-life of 1 ± 0.15 h was also found in the decay curve of the total activity of the iridium fraction.

The longer-lived activity with a half-life of ~ 90 days (Figs. 1 and 2) is due to the formation of Os^{185} from the 15-hour Ir^{185}. The shorter-lived activity, decaying with a half-life of 10 ± 2 min, belongs to the osmium isomer Os^{190m}.

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Note: Figure translations are in progress. See original paper for figures.