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ELEMENTARY PARTICLES AND FIELDS
Experiment

Coherent Fragmentation of ^{12}C Nuclei of Momentum 4.5 GeV/c per Nucleon Through the ^{8}Be$_{g.s.}$+^{4}He Channel in a Nuclear Photoemulsion Containing Lead Nuclei

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Abstract—A two-particle channel in which an unbound nucleus of ^{8}Be in the ground state (^{8}Be$_{\text{g.s.}}$) was one of the fragments was selected among events where ^{12}C nuclei of momentum 4.5 GeV/c per nucleon undergo coherent dissociation into three alpha particles. The events in question were detected in a track nuclear photoemulsion containing lead nuclei, which was irradiated at the synchrophasotron of the Laboratory of High Energies at the Joint Institute for Nuclear Research (JINR, Dubna). The average transverse momentum of alpha particles produced upon the decay of ^{8}Be$_{\text{g.s.}}$ nuclei was 87 ± 6 MeV/c, while that for "single" alpha (α_s) particles was 123 ± 15 MeV/c. The average value of the transverse-momentum transfer in the reaction being considered, $P_t(^{12}\text{C})$, was 223 ± 20 MeV/c. The average value of the cross section for this channel involving Ag and Br target nuclei was 13 ± 4 mb, while the cross section for the reaction on the Pb nucleus was 40 ± 15 mb. The Coulomb dissociation contribution evaluated on the basis of the number of events where the momentum $P_t(^{12}\text{C})$ did not exceed 0.1 GeV/c saturated about 20%. In nine events, the measured total transverse energy of the fragments in the reference frame comoving with the decaying carbon nucleus did not exceed 0.45 MeV, which did not contradict the excitation of the participant ^{12}C nucleus to the level at 7.65 MeV. The average value of the transverse momentum in those events was 234 ± 25 MeV/c.

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INTRODUCTION

The isotopic composition of fragments and their momenta in extremely peripheral processes of fragmentation of relativistic nuclei are likely to reflect most adequately structural features of these nuclei [1]. The dissociation of relativistic ^{12}C nuclei into three alpha particles that is not accompanied by the breakup of the target nucleus is thought to be one of the most peripheral reactions and is referred to as coherent dissociation [2]. Upon detecting all fragments of a relativistic nucleus in this reaction, one can measure the differential cross section with respect to the momentum transfer. Measurements of differential cross sections makes it possible to determine special features in the behavior of the cross sections, to pinpoint the momentum-transfer regions of electromagnetic and nuclear interactions, and to estimate the contributions of the interference between these interactions. Experimentally, this reaction was observed and was studied at the synchrophasotron of the Laboratory of High Energies at the Joint Institute for Nuclear Research (LHE, JINR, Dubna) in nuclear track photoemulsions [3–5]. It turned out that, in such events, there were two alpha-particle groups characterized by different momentum-transfer distributions. This circumstance and close particle-emission angles in the azimuthal plane (close angular correlation of particles) in those events are at odds with the concept of independent fragment emission in the model of fast fragmentation of nuclei. Moreover, observed features are likely to reflect not only the structure of nuclei but also the dynamics of the nucleus–nucleus interaction. Similar conclusions were also drawn in studying the coherent dissociation of relativistic ^{12}C nuclei into three alpha particles in a propane bubble chamber [6, 7]. The cross sections measured in those experiments for the respective reaction on a proton, on a ^{12}C nucleus, and on

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track-emulsion nuclei gave no way to single out the electromagnetic mechanism of the interaction of nuclei. With the aim of discovering Coulomb excitation, the fragmentation of ^{12}C nuclei was studied in [5] by employing a track emulsion that contained lead nuclei. The cross-section value obtained there, which was approximately twice as large as the reaction cross section in an ordinary track emulsion, was explained by the authors of that study by the possible contribution of the Coulomb mechanism of interaction between ^{12}C and lead nuclei. It also turned out that the aforementioned special features of the momentum distribution of particles and close directions for these particles in the azimuthal plane were the most pronounced in those events. A narrow angular correlation of particles may be due to the contribution of the fragmentation channel involving the production of ^{8}Be nuclei that is followed by their decay to two alpha particles. Fragments in the form of ^{8}Be nuclei were detected in a track emulsion in the reaction $^{9}\mathrm{Be} + \mathrm{Em} \to ^{8}\mathrm{Be} + n$ induced by ^{9}Be nuclei accelerated at the JINR nuclotron to a momentum of 2 GeV/c per nucleon [8, 9]. Until recently, there was no successful separation of the channel in which relativistic ^{12}C nuclei suffered fragmentation in a track emulsion, producing ^{8}Be nuclei. In particular, the two-body channel of fragmentation of ^{12}C nuclei to a ^{8}Be nucleus in the ground state ($^{8}\mathrm{Be}_{\mathrm{g.s.}}$) and an alpha particle could not be separated either. In the present study, the channel in which a $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nucleus appears as one of the fragments in the fragmentation of ^{12}C nuclei is isolated among events of the coherent fragmentation of ^{12}C nuclei to three alpha particles detected in a track emulsion containing lead nuclei. The two-body channel of nuclear dissociation of relativistic nuclei can be described on the basis of the Akhieser–Glauber–Sitenko diffraction theory of nuclear scattering [10] in the approximation where the relativistic nucleus involved is assumed to have a cluster structure and which was proposed in [11, 12]. This model was tested by Fetisov [13, 14] in calculating the differential cross sections with respect to the transverse-momentum transfer for the fragmentation of relativistic ^{7}Li nuclei through the $^{3}\mathrm{H}+^{4}\mathrm{He}$ channel on nuclei and protons in a track emulsion. The cross section for the dissociation process induced by a Coulomb field was calculated on the basis of the Bertulani–Baur formalism [15, 16]. In doing this, it is assumed that the Coulomb amplitude is small for impact parameters shorter than the sum of the radii of colliding nuclei. An analysis of experimental differential cross sections with respect to the momentum transfer on the basis of this model permitted revealing a suppression of the diffraction nuclear cross section for the fragmentation of nuclei in the region around zero momentum transfer, pinpointing momentum-transfer regions of nuclear and Coulomb interactions, and estimating the contribution of Coulomb interaction. In those calculations, the Coulomb and nuclear cross sections for the dissociation of ^{7}Li nuclei were rather broadly separated in momentum transfer. This indicates that, in the reaction being considered, the contribution of the interference between the nuclear and Coulomb interactions is small.

DESCRIPTION OF OUR EXPERIMENT

The experiment being discussed detected events in which ^{12}C nuclei of primary momentum 4.5 GeV/c per nucleon suffered dissociation into three relativistic projectile fragments of charge number $Z = 2$ upon interaction with nuclei of a BR-2 track photoemulsion doped with lead in proportion of one lead atom per five silver atoms. Stacks of track-emulsion layers 480 μm in thickness were irradiated along emulsion layers with a beam of ^{12}C ions accelerated to a momentum of 4.5 GeV/c per nucleon at the LHE JINR synchrophasotron. In order to estimate the reaction cross section, searches for respective events were performed via viewing along a projectile track. In order to enlarge the statistical data sample more quickly, the search was continued over an area. This resulted in finding 72 events featuring no signature of target-nucleus breakup and no extra relativistic track. For a more detailed description of the experiment as such and measurements of particle-emission angles in specific events, the interested reader is referred to [5]. In preparing the present article, we have measured once again the average range of ^{12}C nuclei for the $^{12}\mathrm{C} \to 3\alpha$ process in a track emulsion containing lead nuclei. Over 148 m of scanned tracks, we have found 13 events in which ^{12}C nuclei decayed to three alpha particles. The respective value of the average range of ^{12}C nuclei for the above reaction in the track photoemulsion is 11 ± 3 m. The channel in which ^{12}C nuclei fragment into a $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nucleus, which is unbound, and a "single" alpha particle (α_s) stands out among the $^{12}\mathrm{C} \to 3\alpha$ events that we found. The $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nucleus has a positive energy of 92 keV; therefore, it immediately decays to two alpha particles. The maximum value of the spatial opening angle for such alpha particles is determined by the ratio of the momenta that they receive in the decay of the product $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nucleus and by the momentum of the projectile nucleus. In the case where the momentum of accelerated projectile nuclei is 4.5 GeV/c per nucleon, the maximum opening angle for the alpha particles in question is about 2 mrad. In the present study, we consider, instead of the opening angle mentioned above and used most frequently, the relative transverse energy of two alpha particles, $E_{2\alpha}$. The value of $E_{2\alpha}$ is determined by the magnitude of the vector difference of the alpha-particle transverse momenta. This quantity is independent of the energy of accelerated nuclei, is more natural, and admits a clearer interpretation. The maximum value of $E_{2\alpha}$ for particles originating from the decay of a $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nucleus is 92 keV. In order to single out events involving such particle pairs, a particle pair characterized by the minimum value $E_{2\alpha,\min}$ is found in each event. Figure 1*a* gives the distribution of events with respect to $E_{2\alpha,\min}$ in the region extending up to 500 keV. In a narrow region of $E_{2\alpha,\min}$ values not higher than 120 keV, one can see an isolated group of 31 events. There are nine events in the region of higher $E_{2\alpha,\min}$ values not greater, however, than 500 keV. In the range between 92 and 120 keV, the experimental $E_{2\alpha}$ distribution for particles produced in the decay of $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nuclei exhibits broadening, which one can use to estimate the accuracy of geometric measurements. According to this estimation, the error in determining the opening angle for the particles under study is about 0.3 mrad. This value is close to the mean multiple-scattering angle of 0.2 mrad in a track emulsion over the base length of 1 mm for alpha particles of momentum 18 GeV/c per nucleon. We assume that particle pairs for which the measured value of $E_{2\alpha}$ does not exceed 110 keV satisfy the condition for the decay of $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nuclei. In the region extending up to 110 keV, the distribution in question contains 30 events. Figure 1*b* gives the $E_{2\alpha}$ distribution of combinations of a third "single" particle and two closer particles in an event. In the energy region extending to 110 keV, this distribution contains three combinations. Of these, two combinations belong to one event in which all three alpha particles form a compact narrow "jet" in which $E_{2\alpha}$ values does not exceed 110 keV for all three combinations of particle pairs. In one event, the value of $E_{2\alpha}$ does not exceed 110 keV for the combination of a "single" particle with one of the particles from a narrow pair.

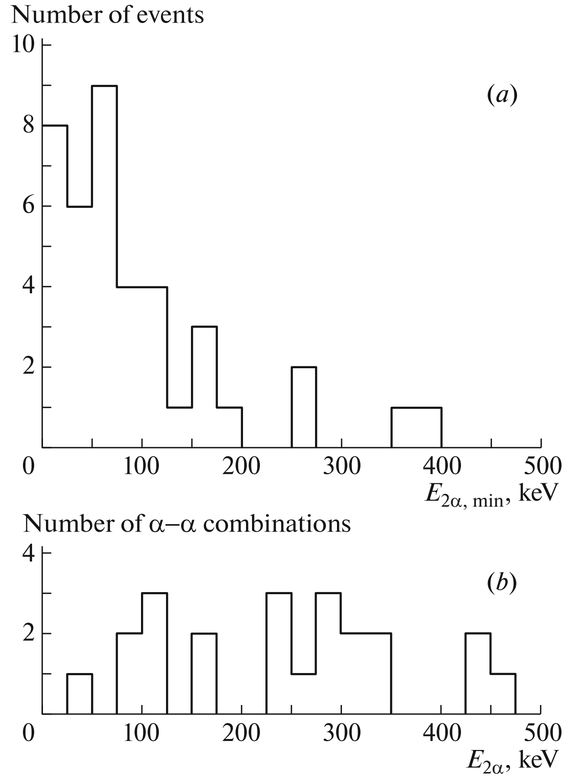

Fig. 1. (*a*) Distribution of events with respect to the minimum transverse energy of two particles in an event, $E_{2\alpha,\min}$, and (*b*) distribution of the number of combinations of a third "single" particle and two closer particles in an event with respect to the transverse energy of two particles, $E_{2\alpha}$.

RESULTS OF OUR MEASUREMENTS

The momentum-transfer dependence of the differential cross sections for the reaction being considered is one of the most important features of the underlying nucleus–nucleus interaction. The character of this dependence is determined by the ratio of the contributions of the nuclear and Coulomb mechanisms of interactions between nuclei. In the reaction being considered, the transverse momentum $P_t(^{12}\mathrm{C})$ is equal to the vector sum of the transverse momenta of all three alpha particles. Figure 2 shows the

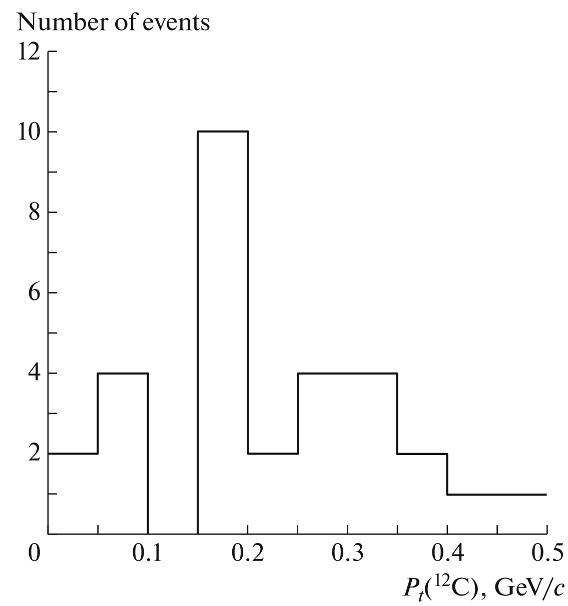

Fig. 2. Transverse-momentum $[P_t(^{12}\mathrm{C})]$ distribution of reaction events.

$P_t(^{12}\text{C})$ distribution of events over the range extending up to 0.5 GeV/c. The average value of $P_t(^{12}\text{C})$ is 223 MeV/c, and the variance of the distribution is 108 MeV/c. In addition to the average value of $P_t(^{12}\text{C})$, Table 1 gives the average value of $P_t(^7\text{Li})$ for the two-cluster dissociation of ^{7}Li nuclei. The average value of $P_t(^{12}\text{C})$ exceeds substantially that of $P_t(^7\text{Li})$, which is 166 MeV/c [17]. In the reaction considered here, $P_t(^{12}\text{C})$ values exceed 0.2 GeV/c in approximately 50% of events, while, in the fragmentation of ^{7}Li nuclei, the fraction of events in this region is less than 30%. In just the same way as in the dissociation of ^{7}Li nuclei, large values of $P_t(^{12}\text{C})$ suggest that the nuclear mechanism plays a decisive role here in the interaction between nuclei. At impact parameters greater than the target radius, it is natural to expect a sizable Coulomb contribution in the region of momentum transfers $P_t(^{12}\text{C})$ below 0.1 GeV/c. The fraction of events falling within this region is 20%.

A track emulsion contains a group of light nuclei that have close mass numbers (^{12}C, ^{14}N, and ^{16}O) and heavy nuclei of ^{107}Ag and ^{79}Br. In a track emulsion, it is impossible to pinpoint a nucleus with which a given projectile interacts. Therefore, one determines the reaction cross section averaged over all track-emulsion nuclei, $\sigma(\text{Em})$. It is related to the projectile mean range (path length) λ by the equation $\sigma(\text{Em}) \cdot (N_\text{l} + N_\text{h})\lambda = 1$, where N_l and N_h are the numbers of, respectively, light and heavy nuclei per 1 cm^3 of the track emulsion used. But in order to estimate the contribution of the fragmentation of ^{12}C nuclei on light nuclei in the track photoemulsion, one can use the cross section measured in a propane bubble chamber for the fragmentation of ^{12}C nuclei on a carbon target [6, 7]. The cross section for the $^{12}\text{C} \to 3\alpha$ process on a ^{12}C nucleus is 4.8 ± 0.7 mb, while the cross section for the fragmentation channel involving the production of a $^8\text{Be}_{\text{g.s.}}$ nucleus is 1 ± 0.4 mb, which is close to the background level. For the reaction under study proceeding in an ordinary track emulsion, we have $\sigma_\text{l} N_\text{l} + \sigma_\text{h} N_\text{h} = 1/\lambda$, where σ_l and σ_t are the cross sections for the reaction on, respectively, light and heavy track-emulsion nuclei. In an ordinary track emulsion, all events were found by means viewing along the tracks of ^{12}C nuclei. Owing to this, the values of λ are determined both for 3α events and for events containing a $^8\text{Be}_{\text{g.s.}}$ nucleus from the numbers of respective events that we found. In an ordinary track emulsion, the mean range of ^{12}C nuclei for events involving a ^{8}Be nucleus is 33 ± 10 m. By employing the λ value obtained in this way, the cross section for the $^{12}\text{C} \to {}^8\text{Be}_{\text{g.s.}} + \alpha$ process in the case of Ag and Br target nuclei can be estimated at 13 ± 4 mb. The fraction of events involving a $^8\text{Be}_{\text{g.s.}}$ fragment in the total set of events of the fragmentation of ^{12}C nuclei to three alpha particles is 32%. By employing this value and the measured mean range of nuclei for events involving three alpha particles, we find that the mean range of nuclei for events featuring a $^8\text{Be}_{\text{g.s.}}$ fragment in a track emulsion containing lead nuclei, $\lambda(\text{Em} + \text{Pb})$, has a value of 34 m, while the cross section for the reaction in a track emulsion on lead nuclei is 40 ± 15 mb.

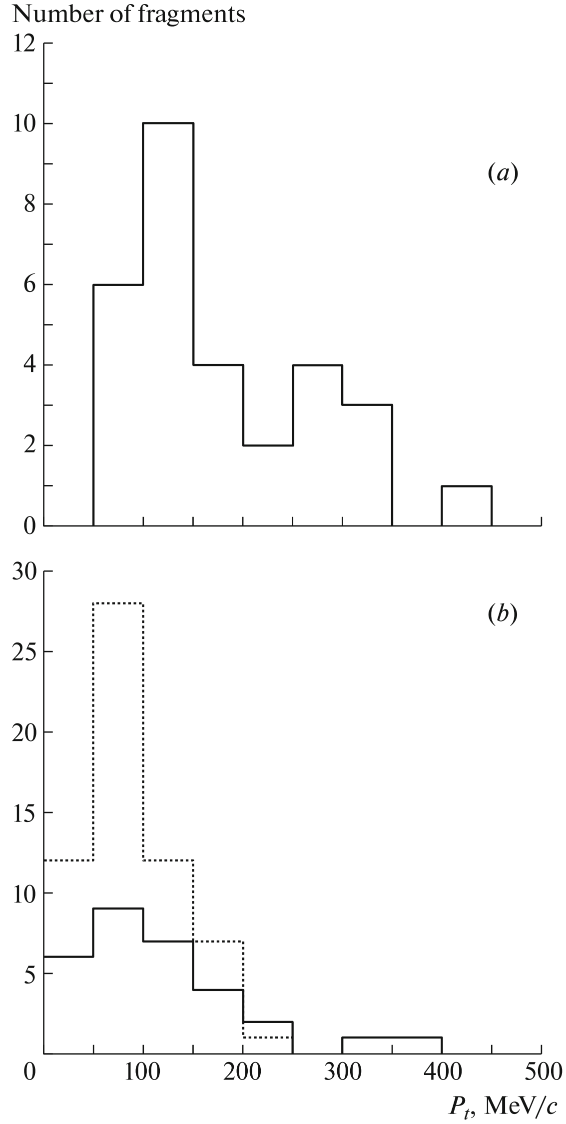

Fig. 3. Transverse-momentum (P_t) distribution of fragments for (a) a $^8\text{Be}_{\text{g.s.}}$ nucleus and (b) a "single" alpha (α_s) particle (solid-line histogram) and an alpha particle originating from the decay of $^8\text{Be}_{\text{g.s.}}$ nuclei (dotted-line histogram).

Transverse-momentum distributions of fragments of relativistic nuclei depend greatly on the nuclear-

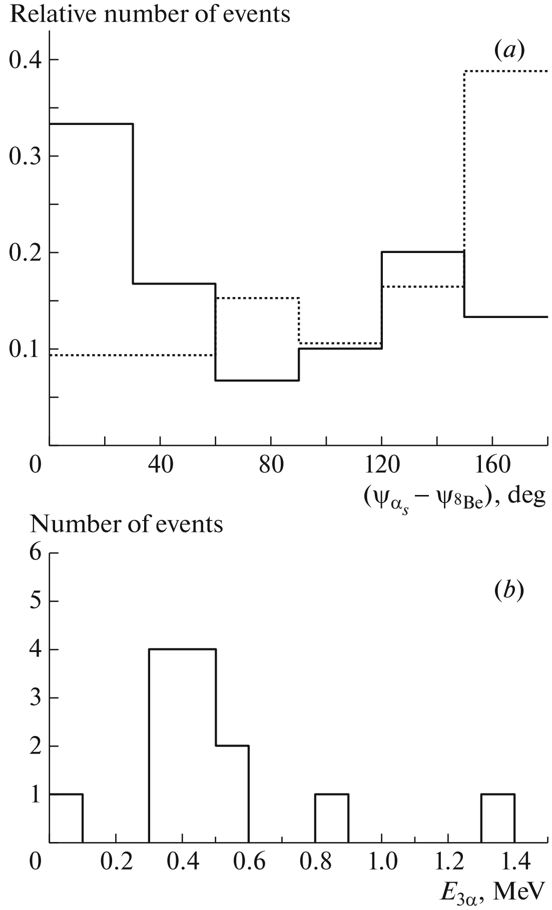

Fig. 4. (a) Distribution of events with respect to the azimuthal angle between the fragment-emission directions for (solid-line histogram) ^{12}C and (dotted-line histogram) ^{7}Li nuclei; (b) distribution of events with respect to the transverse energy of three alpha particles, $E_{3\alpha}$, in the reference frame comoving with the their center of mass.

fragmentation mechanism. In the case of nuclear fragmentation not leading to the formation of an excited intermediate nucleus, fragments that did not participate actively in the nucleus–nucleus interaction retain their intranuclear momenta. From the emission angles for a pair of alpha particles originating from the decay of the product ^{8}Be$_{\text{g.s.}}$ nucleus, one determines the emission angle for this nucleus and its transverse momentum. Figure 3a gives the transverse-momentum distribution of ^{8}Be$_{\text{g.s.}}$ nuclei in the laboratory frame. The average transverse momentum of ^{8}Be$_{\text{g.s.}}$ fragments, $P_{t,^8\text{Be}}$, is 173 MeV/c, while the variance of the above distribution in 91 MeV/c. In Fig. 3b, the solid-line histogram represents the distribution of "single" alpha (α_s) particles, while the dotted-line histogram stands for the distribution of alpha particles from the decay of ^{8}Be$_{\text{g.s.}}$ nuclei. The average transverse momentum of α_s particles, P_{t,α_s}, is 123 MeV/c, while the the variance of their distribution is 80 MeV/c. The transverse momenta of alpha particles from the decay of ^{8}Be$_{\text{g.s.}}$ nuclei have an average value of 87 MeV/c, which is substantially smaller than the average transverse momentum of α_s particles. Thus, there are two alpha-particle groups in this reaction that differ in production mechanism and have different transverse-momentum distributions. Moreover, many particles participate actively in this case in the interaction with target nucleons. Therefore, the momentum distribution of all alpha particles in this set of events cannot in principle reflect the momentum distribution of alpha-particle clusters in the ^{12}C nucleus. Table 1 also gives the average transverse momenta of ^{4}He and ^{3}H fragments formed in the dissociation of ^{7}Li nuclei. In contrast to what occurs upon the fragmentation of ^{7}Li nuclei, the momenta of ^{8}Be$_{\text{g.s.}}$ nuclei from the fragmentation of ^{12}C nuclei exceed substantially the momenta of α_s particles. This may be due, for example, to the difference in cross section for the scattering of the respective clusters of the ^{12}C nucleus on target nucleons. In that case, the cross section for the beryllium cluster exceeds the cross section for an alpha-particle cluster. Moreover, it is possible that a strong binding of clusters in the ^{12}C nucleus may also lead to the scattering of a ^{12}C nucleus as a discrete unit, with the result that it undergoes excitation to energies above the threshold for the decay of the ^{12}C nucleus to fragments.

Special features of the nucleus–nucleus interaction may also affect the character of the angular correlation between fragments. Figure 4a gives the distribution of events with respect to the azimuthal angle between fragment-emission directions in the laboratory frame, $\psi_{\alpha_s,^8\text{Be}} = (\psi_{\alpha_s} - \psi_{^8\text{Be}})$. In half of the events, $\psi_{\alpha_s,^8\text{Be}}$ does not exceed 60°; the average value of $\langle\psi_{\alpha_s,^8\text{Be}}\rangle$ is 76°. This distribution differs substantially from the analogous distribution of events of the two-cluster fragmentation of ^{7}Li nuclei, in which case the angle between the fragment-emission directions, $\psi_{\alpha,^3\text{H}}$, is larger than 120° in half of the events, the average value of $\langle\psi_{\alpha,^3\text{H}}\rangle$ being 115°. An enhanced concentration of events in the region of small values of the angle $\psi_{\alpha_s,^8\text{Be}}$ may be due to the contribution of events in which the relative energy of particles is low. Figure 4b shows the distribution of events with respect to the total energy of three alpha particles, $E_{3\alpha}$, in the reference frame comoving with the scattered ^{12}C nucleus. This distribution features a group of events in the narrow range of 300–500 keV. Table 2 lists basic features of events in which $E_{3\alpha}$ does not exceed 500 keV. Events in which $E_{3\alpha}$ is not higher than 375 keV satisfy the condition under which

Table 1. Features of events of the fragmentation of ^{12}C and ^{7}Li nuclei through two-cluster channels in a track nuclear photoemulsion in the laboratory frame

Reaction	Momentum, A GeV/c	Number of events	$\langle P_t(A)\rangle$, MeV/c	$\langle P_{t,\mathrm{l}}\rangle$, MeV/$c$	$\langle P_{t,\mathrm{h}}\rangle$, MeV/$c$	$\langle \psi_l - \psi_\mathrm{h}\rangle$, deg	References
$^{12}\mathrm{C} \to {}^{8}\mathrm{Be}_{\mathrm{g.s.}} + \alpha$	4.5	30	223	132	173	76	Present study
$^{7}\mathrm{Li} \to {}^{4}\mathrm{He} + {}^{3}\mathrm{H}$	3.0	83	166	137	136	115	[17]

Table 2. Features of events in which $E_{3\alpha}$ does not exceed 500 keV

Event number	$P_t(^{12}\mathrm{C})$, MeV/c	$E_{3\alpha}$, keV	$E(^{12}\mathrm{C})$, MeV	$E_{2\alpha}$, keV	$E_{2\alpha}$, keV	$E_{2\alpha}$, keV	$P_{t,^8\mathrm{Be}}$, MeV/c	P_{t,α_s}, MeV/c	$\psi_{\alpha_s} - \psi_{^8\mathrm{Be}}$, deg
6	185	433	7.71	428	119	102	159	36	48
15	188	316	7.59	309	47	118	120	82	42
17	300	405	7.68	297	302	9	169	136	22
18	153	500	7.77	472	41	237	65	96	35
24	365	425	7.70	72	234	331	222	149	23
25	188	372	7.65	349	172	37	111	90	41
46	185	89	7.36	85	9	40	103	82	3
50	165	302	7.58	272	166	15	144	30	68
53	344	437	7.71	429	119	108	211	140	24
66	187	321	7.60	290	98	93	104	89	28

the ^{12}C nucleus may undergo decay from the excited level at 7.65 MeV. Five events meet this condition. But if we assume, with allowance for the possible measurement errors, that the measured value of $E_{3\alpha}$ should not exceed 450 keV, four more events satisfy the condition in question. In one event where all three $E_{2\alpha}$ values does not exceed 110 keV, $E_{3\alpha}$ is 89 keV. Table 2 additionally gives the excitation energy of the participant carbon nucleus, E(^{12}C), in events; this excitation energy is equal to the sum of $E_{3\alpha}$ and the mass difference between the three alpha particles from the dissociation process and the ^{12}C nucleus. A correlation of events singled out in Fig. 4*b* and characterized by small values of the angle between the fragment-emission directions, $\psi_{\alpha_s,^8\mathrm{Be}}$, can be traced on the basis of the values presented in Table 2 for this angle. In one event, the angle $\psi_{\alpha_s,^8\mathrm{Be}}$ is 68°, while, in the remaining ones, it does not exceed 50°. The average value of $\psi_{\alpha_s,^8\mathrm{Be}}$ is 33°. In all events quoted in Table 2, the values of $P_t(^{12}\mathrm{C})$ exceed 150 MeV/c. In those events, the average value of the transverse-momentum transfer $P_t(^{12}\mathrm{C})$ is 234 MeV/c.

CONCLUSIONS

Among events in which ^{12}C nuclei whose momentum per nucleon is 4.5 GeV/c undergo fragmentation to three alpha particles in a track nuclear photoemulsion containing lead nuclei, we have selected the two-body fragmentation channel in which a $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nucleus appears as one of the fragments. In respective events, $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nuclei have been identified on the basis of two relativistic alpha particles for which the measured value of the relative transverse energy does not exceed 110 keV. In the reaction being considered, the average transverse momentum $P_t(^{12}\mathrm{C})$ is 223 ± 20 MeV/c. The number of events in the range of values of the momentum $P_t(^{12}\mathrm{C})$ below 0.1 GeV/c, where it is natural to expect a sizable contribution of Coulomb interaction for impact parameters larger than the target radius, saturates 20%. The average transverse momentum of $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nuclei in the laboratory frame is 173 ± 17 MeV/c, while the average transverse momentum of “single” alpha (α_s) particles is 123 ± 15 MeV/c. The average transverse momentum of alpha particles originating from the decay of $^{8}\mathrm{Be}_{\mathrm{g.s.}}$ nuclei is 87 ± 6 MeV/c. Thus, we have seen that, in these events, there are two particle groups that arise via different production mechanisms and which have different momentum distributions. The cross section for the channel of the reaction on Ag and Br target nuclei is 13 ± 4 mb. The cross section for the reaction on a lead nucleus is 40 ± 15 mb. We have separated a group of nine events in which the total transverse energy of three alpha particles, $E_{3\alpha}$, in the reference frame comoving with their center of mass does not exceed 0.45 MeV, which is compatible with the decay of the ^{12}C projectile nucleus from the excited level at the energy of 7.65 MeV. In those events, the average transverse-momentum transfer is (234 ± 25) MeV/c. The experimental data that we obtained for the fragmentation of ^{12}C nuclei through the $(^8\mathrm{Be}_{\mathrm{g.s.}} + \alpha)$ channel may serve as a useful test of theoretical models developed for describing the interaction of nuclei at relativistic energies.

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