Characteristics of the black particle emitted in FHS in the interaction of $^{84}Kr_{36}$ with NED at 1 GeV per nucleon

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Introduction

Target fragmentation is one of the important processes observed in nucleus-nucleus collisions at relativistic energy [1]. The particle emission angle has been recognized to be an important feature of heavy-ion interactivity at intermediate as well as higher energy. Its importance is confirmed by the fact that it continues to be the subject of intense experimental and theoretical studies. The Participant Spectator (PS) model is the basic model which explain the reaction mechanism of the two interacting nuclei in details [1–3]. According to PS model the region of two interacting nuclei which do not take part in the interactivity is known as spectator region and the overlaping region is known as participant region. The black particles is basically emmerged from the spectator region of the target nuclei. In this analysis we have focused on the emission probability of the black particles emmerged in the forward hemisphere ($\theta < 90^0$) in the interactivity of the $^{84}Kr_{36}$ with CNO and AgBr target group of emulsion detector.

Experimental Detail

The Nuclear Emulsion Detector (NED) is a composite target detector containing Br, Ag, C, N, O and H in the different ratio as per experimental requirement [1–3]. In this study we have used NIKFI BR-2 emulsion plates which was prepaired at GSI, Darmstadt (Germany) and the scanning of the emulsion plates to search the event of interest was performed at nuclear laboratory of physics department, BHU, India [1–3]. In the scanning of the events of interest we have used high resolution binocular microscope (Olympus BH-2) [2, 3]. The microscopic image of the event of interest is shown in Fig. 1. To scan the event of interest we have used two well known methods known as line and volume scanning, after scanning all the events are classified into different groups based on their characteristics, such as their range (L) in emulsion plate, relative velocity (β) as well as normalized grain density (g^*) [1–3]. *Shower Particles*; these particles draws $g^* < 1.4$, $\beta > 0.7$. Basically pions and kaons are coming in this categories [2]. *Grey Particles*; these particles draws $1.4 < g^* < 6.0$, $0.3 < \beta < 0.7$ and $L > 3$ mm. Basically it is knocked out protons which contain E_P in between 30 to 400 MeV [3]. *Black Particles*; these particles draws $g^* > 6.0$, $\beta < 0.3$ and $L < 3$ mm. Basically protons having E_P less than 30 MeV coming in this categories [1]. *Heavily ionizing charged particles*; the total of grey particles and black particles (i.e. $N_h = N_g + N_b$) are known as heavily ionizing

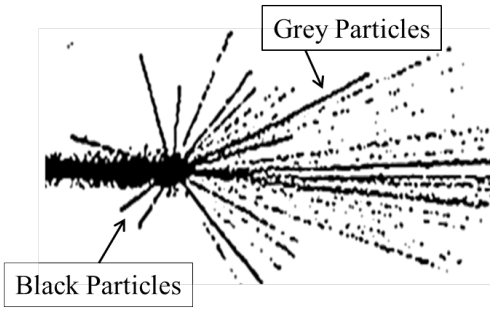

FIG. 1: The microscopic image of the event after collision.

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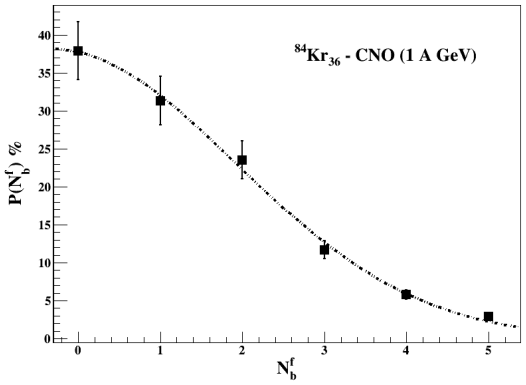

FIG. 2: Emission feature of black particle emitted in forward hemisphere emmerged from the interactivity of $^{84}Kr_{36}$ with CNO target of the NED at 1 GeV per nucleon.

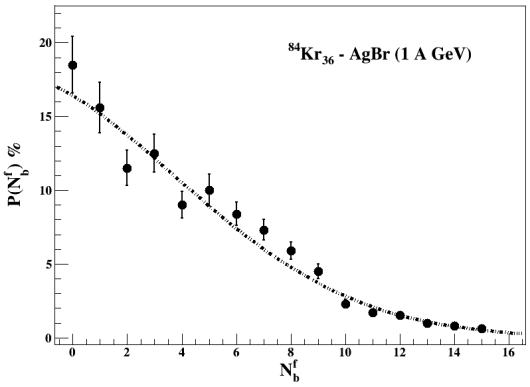

FIG. 3: Emission feature of black particle emitted in forward hemisphere emmerged from the interactivity of $^{84}Kr_{36}$ with AgBr target of the NED at 1 GeV per nucleon.

charged particles [1, 2].

Result and Discussion

In relativistic heavy ion collision the study of target fragmentation is playing an important role to reveals the mechanism involve in two interacting nuclei at relativistic energy. In this analysis we have focused on the emission features of the black particles emmerged in the interactivity of $^{84}Kr_{36}$ with CNO and AgBr target groups of the NED at 1 GeV per nucleon.

Fig. 2 shows the emission feature of the black particles emmerged in forward hemisphere ($\theta < 90^0$) in interactivity of the $^{84}Kr_{36}$ with CNO target of NED. From Fig. 2 we observed that the emission probability of the black particle showing the decay behaviour i.e. the emission probability of less number of black particles is more as compared to the emission probability of the higher black particles.

Fig. 3 shows the emission feature of the black particles emmerged in forward hemisphere in interactivity of the $^{84}Kr_{36}$ with AgBr target of NED. From Fig. 3 we can see that the emission possibility of 0 and 1 events is higher as compared to others. The emission possibility of 2-3 events is almost same similarly for the events 4-6 emission possibilty is same. From 7-9 the emission possibilty is decreasing very fast while from 10-15 its showing very small variation in emission possibility.

Conclusion

The present analysis show that the emission feature of black particles emmmerged in forward hemisphere in the interactivity of $^{84}Kr_{36}$ with NED at 1 GeV per nucleon strongly depends on the interaction with different types of target groups (such as CNO, AgBr) of NED.

Acknowledgments

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