different concentrations, and I-V curve was measured in KCl solution from low to high concentration. The data were plotted with error bars of standard deviation. As shown in Fig. 2, the rectification coefficient increases with the KCl concentration.

We suppose that the rectification effect in the biconical nanopores is due to the adsorption of Fe^{3+} on the carboxyl group inside one of the cone pores, and this phenomenon results in the reversal of the charge state of the inner wall from negative to positive[2,3]. When negative voltage is applied to the modified cone, the anions in the cone moved under the action of the electric field are attracted by the carboxyl chain modified by Fe^{3+}, at this time the carboxyl chain is positively charged to play an acceleration role for the anions to pass through the tip of the biconical nanopores.

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5 - 42 Study on the Single Event Reliability of PAVLOV Neuron System

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The reliability of the AI systems to the harsh space radiation is of great concerns with the increasing application in aerospace. Because of its neuromorphic device architecture and operation mode, low-power neuron chips have enormous potentials in resistance of single event effect, which is one of the most important failures of spacecraft caused by space radiation. In this work, a mixed-signal spiking neuron chip, named PAVLOV[1], has been studied at circuit and chip level with respect to its response to single event errors. Laser and heavy ion beam irradiation were performed to evaluate the single event reliability of the neuron system. Figure 1 shows the setup of the heavy ion irradiation tests. The PALOV system was irradiated with 6 MeV/u Kr and 10.32 MeV/u Bi respectively and the output signal V_{W-23}, which is the key signal of the working state of the chip, was monitored to determine whether the chip was affected by the irradiation. The test data were summarized in Table 1, which indicate that the Pavlov neuron chip possesses excellent SEE immunity performance because there was no single event abnormal signal observed during the irradiation tests. This work demonstrates that the AI system based on neuron chip is reliable for robotic and unmanned application with nuclear radiation environments.

Table 1 The parameters of the heavy beam tests.

Ions	**LET** MeV/(mg/cm^2)	**Intensity** ions/(s·cm^2)	**Time**/min	**Effective ions in sensitive unit**
6 MeV/u Kr	36.2	1.8×10^7	30	324
6 MeV/u Kr	36.2	5×10^8	10	3 000
10.32 MeV/u Bi	98	2.7×10^5	40	6

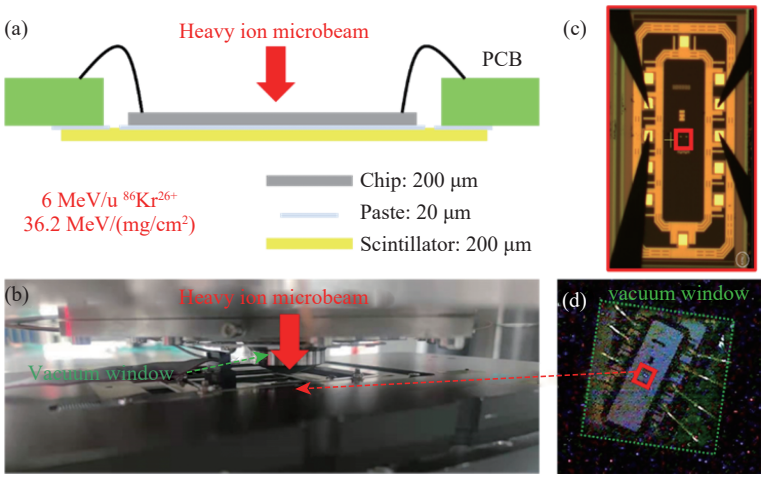

Fig. 1 (color online) Heavy ion irradiation test at the HIRFL microbeam facility: (a) The sample installation, (b) The photo of vacuum window and DUT under irradiation; (c) The photo of PAVLOV chip taken before the test and the core area of the chip (red box); (d) The microscopic photo of the chip taken through the vacuum window and the irradiation area of the large beam spot (red box).

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5 - 43 Enhancement of Enduracidin Production via Alleviation of Oxidative Damage Using Sweet Sorghum Juice as a Feedstock*

Hu Wei, Liu Lu and Chen Jihong

Biochemicals production from sweet sorghum juice is the preferred alternative, but the fermentation efficiency should be further enhanced. Oxygen-mediated microbial cell damage has been reported to boost cell growth and biochemicals production[1]. In present study, the effect of Vc addition on enduracidin production of *Streptomyces fungicidicus* M30 screened after heavy ion mutagenesis, was assessed. As shown in Fig. 1(a), enduracidin titer was significantly enhanced when 90 mmol/L Vc was added into fermentation medium at 2 or 4 d ($P < 0.05$ or 0.01), and the highest enduracidin production was achieved by Vc with the addition time at 4 d. In addition, complete time profiles of cell growth and enduracidin production by M30 strain with the optimized addition amount of 90 mmol/L Vc, were also conducted during all cultivations (Fig. 1(b)). The results showed no significant difference in cell growth at any fermentation phases when Vc was added. However, the addition of Vc led to approximately 9.6 % increase of obtained enduracidin accumulation compared to that with non-supplemented group after 10 d fermentation. The result indicates that the addition of 90 mmol/L Vc can promote enduracidin accumulation.

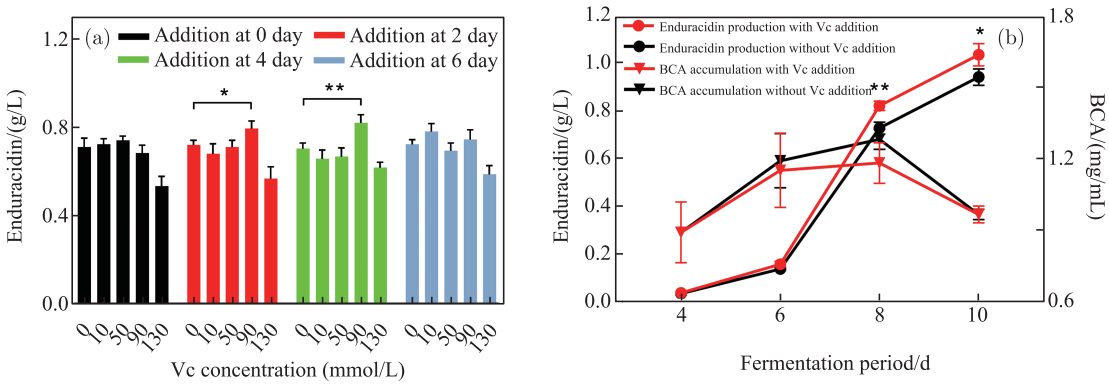

Fig. 1 (color online) (a) The effect of Vc concentration and addition time on cell growth and enduracidin production, (b) Enduracidin production and cell growth when 90 mmol/L Vc was added at 4 d of fermentation. The error bars in the figure indicate the standard deviations of three parallel replicates, and $^*P < 0.05$ indicated a significant difference and $^{**}P < 0.01$ indicated a highly significant difference.