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Development of a transparent Single-grid-type MSGC based on LCD technology

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We have developed a multi-grid-type MSGC (M-MSGC) for neutron applications and proved 0.6 mm neutron spatial resolution for our test detector with a He-3 gas mixture. Then we try to enlarge the size of our M-MSGC for practical use. Also, we tried to fabricate a transparent MSGC and successfully operated the test device as shown in Fig. 1. It was operated in Ar/CF4 gas mixture and both charge and light (because CF4 emits visible light during avalanche process) signals are obtained for Fe-55 photopeaks. However, the manufacturing quality of small companies was a bit problem and we were not successful to fabricate devices over 10cm x 10cm. Recently, we were successfully working with SHARP, the leading LCD (Liquid Cristal Display) company in the world. We could utilize the state of the art LCD technology in this collaboration. Now we consider X-ray applications and reconsider the use of transparent multi-grid-type MSGC principle. IZO electrodes are transparent. We have fabricated a single-grid-type MSGC (S-MSGC) using IZO. The anode width was 5 um and the anode pitch was 150um. We placed an intermediate electrode between the anode and the cathode to stabilize the electric field and separate the anode edge and the cathode edge. This time we just focused on a single grid which plays an important role to the gas gain and the stability. Substrate is normal LCD glass but the surface space between the anode and cathode surface is covered by the grid electrode, therefore we could use high resistivity non-alkaline glass without significant charge-up problem. The test device was fabricated. The effective area of the test device was 15mm x 23 mm. The device was operated in Ar/CH4 and Kr(90%)/CO2(10%) gas mixture. We successfully obtained a gas gain up to 3000. We plan to get signals through optical readout and operated our S-MSGC with an Ar/CF4 gas mixture. The test detector was successfully operated and encouraged by these initial results, we are now fabricating a large area test device in the next run. The use of LCD technology allows us to integrate some simple circuit using TFT. Such an integrated device is our next target but the successful operation of S-MSGC is the very important first step for us.

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