

# Development of large area boron-coated GEM thermal neutron detector in CSNS

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As one of the ideal probes to detect the structure and dynamics behavior of matters, neutron scattering has been widely used in condensed matter physics, chemistry, life science, medicine, material science, aviation and national defense construction and many other fields. With the completion and operation of China Spallation Neutron Source (CSNS), a large number of neutron scattering spectrometers will be built on them, they have an urgent need for high-efficiency, large-area, and position-sensitive detectors. The boron-coated GEM neutron detector has high measurement accuracy, wide dynamic range, and excellent performance, which is one of the development directions of future gas detectors. With the goal of realizing the localization of key technologies and core devices, the ceramic nTHGEM (neutron Thick Gaseous Electron Multiplier) processing technology has been continuous optimized and improved. A ceramic nTHGEM with effective area of 100mm×100mm, 200mm×200mm, and the development of 300mm×300mm ceramic nTHGEM have been successfully realized, which fully meets the requirements of neutron detection. In order to achieve a larger area of boron coating, combined with the special requirements of the boron coating process, a high-performance large-area boron coating device based on magnetron sputtering mechanism was developed in cooperation with Tongji University for the research and production of boron coating process. The device has been functioning normally and successfully coated the boron carbide neutron conversion layer required by the GEM detector and realized neutron detection. At the same time, special ASIC chips are being developed independently, and the self-test is normal. In addition, a large-area high-efficiency multi-layer detector has been developed, and it is planned to be installed on the very-small-angle neutron scattering spectrometer under construction at CSNS as a central detector.

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