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The R&D of Glass Scintillator HCAL for CEPC

The future e+e– Higgs factory, whose main goal is to achieve a precise measurement of mass and properties of the Higgs boson, is the main development trend of the next-generation large collider. A big challenge for this goal is to fulfill an unprecedented jet energy resolution, and the scheme selection of hadronic calorimeter (HCAL) is one of the most important factors. Scintillation materials can convert high-energy rays into visible light. Generally, solid scintillator can be divided into crystal scintillator, plastic scintillator, glass scintillator and ceramic scintillator. Compared with crystal scintillator, the glass scintillator has many advantages, such as a simple preparation process, low cost and continuously adjustable components. Therefore, glass scintillator has long been conceived for application in the nuclear detection such as hadronic calorimeter. Given the deficiency of the crystal and the plastic scintillator, a new concept, Glass Scintillator Hadronic Calorimeter for CEPC (GS-HCAL), was proposed. In 2021, the researchers in the Institute of High Energy Physics (IHEP) have set up the Large Area Glass Scintillator Collaboration (GS group) to study the new glass scintillator with high density and high light yield. Currently, a series of high density and high light yield scintillation glasses have been successfully developed. The density of Ce3+ doped borosilicate and silicate glasses exceed 6 g/cm3 with a light yield of 1000 ph/MeV. And the fast component of scintillation decay time of silicate glass is less than 100 ns (44%). The GSHCAL conceptual design with preliminary detector optimization by simulation has been done. The physics potential and the R&D of the GSHCAL will be presented in this paper.

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