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The study on the quench helium release process of HFRS superconducting magnet

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The quench phenomenon of the accelerator superconducting magnet may occur in operation, which will cause the liquid helium in the cryostat to evaporate rapidly and release to the atmosphere. High-pressure helium will destroy significant components in the transmission line, and the helium released into the tunnel will lead to the ODH (Oxygen Deficiency Hazard), threatening the safety of operators. This paper mainly introduces the helium discharge process of fragmentation separator in HIAF (High-Intensity heavy-ion Accelerator Facility). Firstly, the flow state will be described by the energy equation and Navier-Stokes equation. Meanwhile, the velocity variation, distribution of temperature, and concentration of helium are simulated by 3D modeling when quench occurred in the tunnel. Based on the above analysis we will obtain a reasonable design scheme of the accelerator superconducting magnet relief system for HIAF Fragmentation Separator(HFRS).

Keywords: Emergency relief, The quench, Superconducting magnet, Cryogenic system, Thermodynamic analysis

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