

Numerical Simulation and Analysis on Liquid Nitrogen Spray Heat Exchanger

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Abstract : Liquid spray heat exchanger is the critical equipment of temperature regulating system by gaseous nitrogen which realizes the environment temperature in the range of $-180\text{ }^{\circ}\text{C}\sim+180\text{ }^{\circ}\text{C}$. Liquid nitrogen is atomized into smaller liquid drops through liquid nitrogen sprayer and then contacts with gaseous nitrogen to be cooled. By adjusting the pressure of liquid nitrogen and gaseous nitrogen, the flowrate of liquid nitrogen is changed to realize the required outlet temperature of heat exchanger. The temperature accuracy of shrouds is $\pm 1\text{ }^{\circ}\text{C}$. Liquid nitrogen spray heat exchanger is simulated by CATIA, and the numerical simulation is performed by FLUENT. The comparison between the tests and numerical simulation is conducted. Moreover, the results help to improve the design of liquid nitrogen spray heat exchanger.

Keywords : liquid nitrogen spray, temperature regulating system, heat exchanger, numerical simulation

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