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Design of stainless steel vacuum chambers for the HALF storage ring

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The Hefei Advanced Light Facility (HALF) is positioned as an internationally advanced fourth-generation synchrotron radiation light source in the low-energy range, based on a diffraction-limited storage ring. The stainless steel vacuum chamber is a key component of HALF, with 316LN stainless steel chosen as the primary material. Its mechanical strength, corrosion resistance, low outgassing rate, and excellent process adaptability make it the ideal material for HALF.

The vacuum chamber operates in an environment subject to vibrations and radiation, necessitating high welding process requirements to prevent weld cracks and leaks. The vacuum leak rate is controlled within 2×10-11mbar.l/s. The vacuum chamber is designed to withstand baking temperatures above 250℃. After machining, the magnetic permeability of the chamber is kept at ≤1.01.For certain stainless steel vacuum chambers, the inner surface of the beam channel is coated with oxygen-free copper (TU0). This reduces the outgassing rate from the inner wall, lowers the photon-stimulated desorption coefficient, and ensures a uniform and low vacuum pressure distribution.

Footnotes

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