

The quality analysis for brazing joint of copper/ diamond window using
micro-computed tomography

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Abstract

The diamond window is key component for x-ray beam of micro-focus source, which serves as the transmission x-ray substrate and also the vacuum isolation component. The main advantage of diamond with low atomic number to transmit more electromagnetic radiation, and it also has the great advantage of a high thermal conductivity. However, the fabrication of high-performance diamond window is difficult because of its welding problem between diamond foil and copper holder. The major reason is a huge difference in thermal-expansion-coefficient between the diamond and copper. The formation of metallurgic bond between diamond foil and Ag-Cu-Ti brazing alloy and copper holder is decided to the quality of welding, which can achieve a vacuum degree that meets the requirements of diamond window. In the paper, the fabrication method of diamond window is introduced in detail, and the inspecting inner defects in the brazing joint are employed by micro-computed tomography which could be inspected layer by layer. The research results show that the micro-computed tomography is the prominent equipment to detect the hidden solder joints of copper/ diamond, which offer a high quality diamond window for micro-focus source.

Keywords: diamond window; copper; brazing; micro-computed tomography