

X-Ray CT Scanner for Ceramic Components

Masami Tomizawa and Yoshinori Tanimoto
Manufacturing Automation Equipment Department
TOSHIBA CORPORATION
1 Toshiba-cho, Fuchu-shi, Tokyo, 183 JAPAN

INTRODUCTION

It is generally believed that the prerequisite for making quality evaluation of fine ceramics is a quantitative and three-dimensional determination of any internal defects.

In the case of X-ray CT scanner, information on each section can be visualized as if the test sample is actually sectioned for visual examination.

Its image is constructed on X-ray absorption coefficient, so we can get useful information of inner defects, that is, shapes, locations, sizes, density distribution and so on. For other materials such as aluminum castings and tires for automobiles, X-ray CT scanning technology, originally developed for medical application, has begun to be used. But, application of this technology to fine ceramics is not acceptable because of rather poor resolution. A considerable improvement should be made to make it compatible to microscopic flaws in fine ceramics, and this seems not entirely impossible.

We have developed X-ray CT scanner which has high spatial resolution, and experimented on its availability.

OUTLINE OF HIGH SPATIAL RESOLUTION X-RAY CT SCANNER

Utilizing the second generation scan method.

X-ray tube with very small focus size ($<50\mu\text{m}$) and 64 channels of solid-state detector are installed, a sample table is located between them. The sample table traverses perpendicular to the line connecting the X-ray focus and detector and rotates around its center after each traverse. This motion is repeated 36 times to complete acquisition of all necessary data of the test sample from directions covering 180° .

For a scanning field of 50mm , one scan will take approximately 40 minutes during which all projected data can be collected. A tomographic image is obtained by processing these data with the reconstruction method of filtered back projection.

THE EXAMPLE OF CT SCANNING MADE TO ROUND HOLE SPECIMEN

This specimen made of SiC has eight round through holes, the smallest hole is $\phi 38\mu\text{m}$, all of them are discernible.

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