



Hyogo Science and Technology Association
 3-1-1 Koto, Kamigoricho, Akou County, Hyogo 678-1205 JAPAN
 Tel: +81-791-58-1415

Harima Area

Development of New Functional Materials with Quantum Beam Technology

Core Research Organizations

University of Hyogo, Toyota Technological Institute

Major Participating Research Organizations

Industry...SYONAN NITRIDING Co, Ltd., KURITA Seisakusho Co., Ltd., PLUS. Co., Ltd. and others

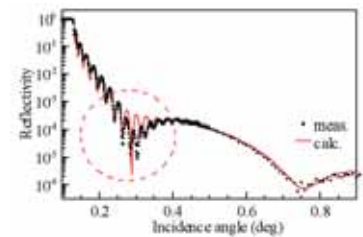
Academia...University of Hyogo, Toyota Technological Institute and others

Government...Hyogo Prefecture, Hyogo Science and Technology Association, The New Industry Research Organization

Typical result of City Area Program

1. The hyperfine structure analysis technology by the synchrotron orbital radiation x-ray microbeam is established.

This research and development project achieved the world-first method using the SPring-8 high brightness synchrotron orbital radiation, although the X-ray reflectivity metrology was a quite effective assessment procedure measurement of laminated structures of thin or multiple films, regardless of its noncrystal or crystal nature, and convex or concave of surface of materials and thickness of membranes. It is an ultra high precision and a high-resolution evaluation technique superior compared with the preceding products. It was also confirmed that it would be effective as an analytical tool of the surface treatment chemical agents for clarification of the adhesive strength improvement process of the DLC film etc.



X-ray reflectivity of DLC thin film

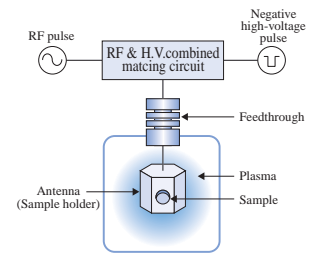
2. It succeeds in the commercialization of "Plasma Based Ion Implantation & Deposition System".

Excel slide corrosion resistance life have DLC film up to now peel off problem limitation plasma directionality processed product rotate have elaborate setup necessary usage restriction provide.

The plasma was generated in the processed product whole face to solve this problem in this research, and the DLC film forming technology was established, and the manufacturing sales began at the Kurita factory Ltd. extra thickness (100 μm) and not sticking (adhesive strength 80Mpa or more) high to three dimensional shape by the method to repeat ion implantation and the deposition alternately by a uniform membrane thickness (uniformity 5% or less).



Plasma Based Ion Implantation & Deposition System (KURITA Seisakusho Co., Ltd.)



Principles of pulse plasma ion implant and film formation method

About the approach after the project

1. Promotion of synchrotron orbital radiation research and development

The high precision X-ray microbeam device and others developed in this research is installed in the experiment hatch newly provided in the SPring-8 Hyogo Prefectural beamline. Even after the project, it is used as the analytical tool for research projects in various fields in the future. It is also planned to be used also in the future.

Other than this, the industry-academia-government projects

for industrial use of Synchrotron orbital radiation including the Spring-8 New Hyogo Beam Line (started operation in 2005) and the regional joint research projects (in 2004-2008) are promoted in Harima Area. It is aimed to be a center of the intellectual creation base of nano technology mainly with the optical science (synchrotron orbital radiation) including Spring-8.



SPring -8 Hyogo Prefectural Beamline



High precision parallel x-ray micro-beam formation equipment

2. Spread promotion of plasma arc machining technology

Practical use and the manufacturing sales has already started for plasma DLC deposition technology by the Kurita Seisakusho in the process of the project. University of Hyogo, the partner of joint research on this subject with Kurita Seisakusho, also plans to develop a new product (new usage development of the surface preparation) with potential user enterprises in the future.