●Basic Stage

Others

(Fiscal Year 2002-2004)

Western Okayama Area

Establishment of Ultra-precision and Ultrafine Processing Technology for Machining Accelerator Cells and so on

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Core Research Organization

Industrial Technology Center of Okayama Prefecture

Major Participating Research Organizations

Industry…YASDA PRECISION TOOLS K.K., Kasen Nozzle Mfg.Co.,Ltd .
Academia…Okayama University, Okayama University of Science, Institute for Cosmic Ray Research, University of Tokyo
Government…Industrial Technology Center of Okayama Prefecture, HIGH ENERGY ACCELERATOR RESEARCH ORGANIZATION, KEK

Typical result of City Area Program

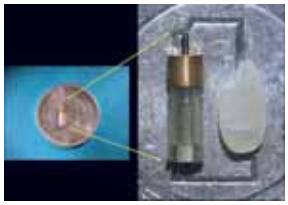
1. Development of ultra-precision lathe with high-accuracy and efficiency

For machining both sides of workpieces using the ultra-precision lathe machine, it was requjired to remove the workpiece from the chuck and remount it at the other side. However, this re-mounting process often tends to reduce the machining accuracy and efficiency.
In this project, a hollow spindle for the both sides machining with one action of chucking, and the ultra-precision lathe incorporating the spindle were developed. It enabled both high accuracy and high efficiency at the same time in the case of both sides machining such as "Accelerator Cells".

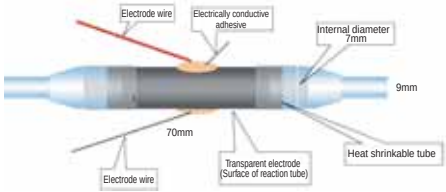
Hollow spindle on ultra-precision lathe

2. Developement of micromachining technology of microreactor and microactuator

The microreactor is a device in which chemical reactions are caused in micro space from some μm to some mm. In this project, many mocroreactors and microactuators were developed for this purpose. For instance, using cylindrical piezo-electric device fabricated from bulk piezoelectric material, a micro ultrasonic motor of 1.8mm in outside diameter and 5.8mm in height was developed. This ultrasonic motor is in size of the world smallest level. As a result, the starting torque of 1.6mNm and the rotating speed of 2800rpm with applying voltage 25Vp-p was achieved. In addition, an active catalyst reactor with superior reaction efficiency and in a simple structure was developed for trial using the stirring mechanism to make the catalyst particles move by static electricity.



Micro ultrasonic motor



Active catalystic reactor

About the approach after the project

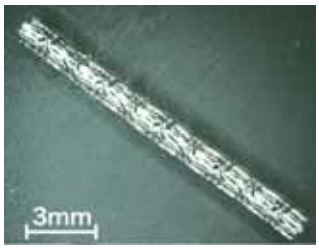
1. Promotion of active microreactor development that applies micromachining technology

"Micro-Manufacturing Okayama creation business project" is promoted by Okayama Prefecture for the upgrade of engineering technologies for the prefecture as a sole project. In 2005, City Area Program(Development Stage) was launched as the leading project of "Micro-Manufacturing Okayama project"..And the theme of this project is "Development of Active-Microreactor for progressive micro reacting process". That is, an excellent "Active Microreactor" is created by combination of the chemical process and the microactuator technology based on ultra-precision machining technology that accumulates in the region.
The trial manufacture and the development of various active devices that the microreactors including those peripherals based on needs-seeds of the chemical related.

Example of stacked micro reactor

2. Promotion of medical device development that is applied high precision manufacturing technology.

The ultra-precision manufacturing technology that has been cultivated in City Area Program (Basic Stage) is currently applied to developments of medical devices compatible to QOL (Quality Of Life). While a life of artificial hip joints is only 10-20 years in general, a longer life is in high demand. So in order to extend its life, a high precision machining technology with ultra-precision lathe is being developed to meet the needs. By using the micro laser machining technology, a medical device "stent", which may be used for angina pectoris treatment is also developed . These projects are conducted as part of Micro Manufacturing Okayama project for promotion of the industry-academia-government cooperation in Okayama area.



Stent for angina pectoris treatment