A Small Spherical Stepping Motor

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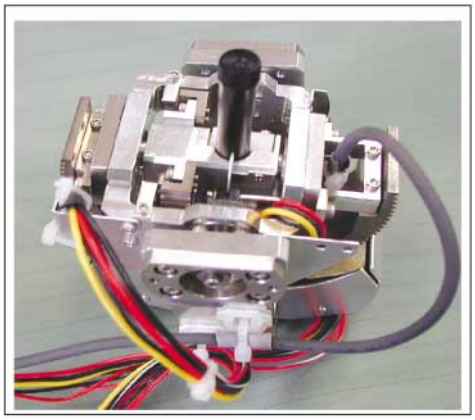
A small spherical stepping motor with two degrees of freedom is developed. The motor is composed of two sub stepping motors. Each sub motor is a two-phase permanent-magnet bipolar linear stepping type, and the shape is semi-circle. The rotational axes of two sub motors cross at the same point, and this structure enables the developed motor to move in any direction. The experimental results show that the developed motor can hold the output shaft in any direction and has high positioning accuracy. This motor will be applied to the robotics eye with small CCD camera.



A Small Spherical Stepping Motor with CCD Camera

A One-Step Conversion of Benzene to Phenol with a Palladium Membrane

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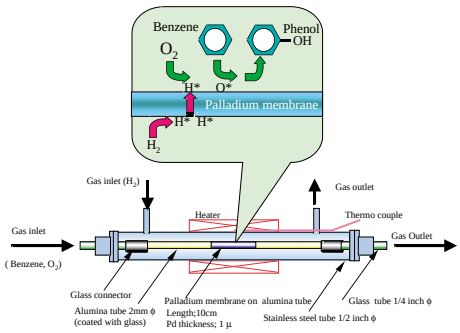
Existing phenol production processes tend to be energyconsuming and produce unwanted by-products. We report an efficient process using a shell-and-tube reactor, in which a gaseous mixture of benzene and oxygen is fed into a porous alumina tube coated with a palladium thin layer and hydrogen is fed into the shell. Hydrogen dissociated on the palladium layer surface permeates onto the back and reacts with oxygen to give active oxygen species, which attack benzene to produce phenol. This one-step process attained phenol formation selectivities of 80 to 97% at benzene conversions of 2 to 16% below 250ºC (phenol yield: 1.5 kilograms per kilogram of catalyst per hour at 150ºC).



Apparatus for direct hydroxylation of aromatics and the working principle of palladium membrane