S6-01

From End of Pipe to Product Integrated Environmental Protection

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For decades, cooperation between chemical industry and microbiology focused on retrospective biodegradability assessment of technically important substances. As a consequence microbiologists were asked to evolve or construct microorganisms capable of decontaminating hazardous waste streams or xenobiotic products in the environment. Meanwhile it is generally accepted that these end of pipe technologies are not in compliance with the aim of a sustainable development. Very often the complexity of mixtures of pollutants found in practice limits applicability. They are certainly an option for existing contaminations particularly at sites with defined pollutants.

S6-02

Fixation of Carbon dioxide into Biodegradable Plastics -----From Lab Curiosity to Industrial Practice

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Though carbon dioxide has been regarded as one of the main green house gases, it is one of the most abundant resources in the world. In this report, carbon dioxide of polymerization grade has been recycled from cement industry as well as oil refinery industry, and fixed into novel plastics-carbon dioxide copolymer, a kind of aliphatic polycarbonate, employing rare earth coordination ternary catalyst.

S6-03

CLEANING SEMICONDUCTOR WAFERS WITH SUPERCRITICAL FLUIDS

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Supercritical fluid technology can be used to significantly reduce water consumption and chemical usage in the process of cleaning semiconductor wafers. Currently an estimated 4 million gallons of wastewater are produced and thousands of gallons of chemicals are used on an average day of operations at a

single semiconductor manufacturing facility. In addition to the current environmental concerns there are technical challenges for the future. As semiconductor device dimensions approach the nanoscale, it will become increasingly difficult to use aqueous-based cleaning processes due to high surface tension and capillary forces. Effective penetration into the high aspect ratio trenches and via structures will be challenging. The rinsing and drying steps will also become more difficult. To meet these environmental and technical challenges, the cleaning of semiconductor wafers will require an innovative technology, significantly different from today's processes. A collaborative effort between industry, government and academia has resulted in the development and commercialization of a new technology to meet these needs of the semiconductor industry.

S6-04

Practical Asymmetric Synthesis in Takasago

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Starting with the development of the *l*-menthol process using BINAP-Rh catalyzed asymmetric isomerization of allylamines, we have been investigating catalytic asymmetric synthesis mainly based on BINAP chemistry for two decades, and have developed various asymmetric synthetic processes. Our industrialized examples and the latest progress are discussed.