

December 26, 2005

## **Development of High-Performance “Nano” Polishing Agents— A Fullerene-Based Technology With Applications in Semiconductor Fabrication**

### **Research Labs of Osaka University’s Graduate School of Engineering and Vitamin C60 BioResearch Corporation File for Joint Patent**

A research group comprised of two labs\* of Osaka University’s Graduate School of Engineering and Mitsubishi Corporation (MC) subsidiary Vitamin C60 BioResearch Corporation has announced the successful results of joint research on the development of “nano” polishing agents utilizing special fullerene derivatives (super-hydrated fullerene—see Chart 1). With the cooperation of the Osaka University Intellectual Property Office, the research group has filed for a patent of the technology, which will have applications in the planarization of wafers used in semiconductors. The group’s research shows that the new polishing agent can produce a level of planarization over five times more uniform than abrasive compounds (slurries containing inorganic oxide particles) currently used in Chemical-Mechanical Polishing (CMP). With current technology, semiconductors are limited to seven or eight level structures, but with the high degree of planarization (flatness) achieved with the new polishing agent, semiconductors of more than ten levels could be manufactured, representing a dramatic improvement. There are high expectations for this breakthrough technology as nano polishing agents utilizing fullerene could greatly elevate the level of integration for semiconductors, taking them from the micro-order to the nano-order.

Conventional polishing agents tend to clump together because slurry commonly used in CMP contains uneven particles (silica, alumina) with diameters ranging from tens of nanometers to hundreds of nanometers. With the newly developed technology, the nano polishing agent contains hydrated fullerene molecules of roughly one nanometer in diameter. Because its high level of water solubility and the uniformity of the shape of the particles, the new polishing agent can produce a slurry that is extremely evenly dispersed at the molecular level. Trials using the nano polishing agent showed that curvature of the surface as well as other irregularities could be evened out at the nano level.

In 2004, the worldwide market for polishing agents used in CMP was about 80 billion yen, but with increasing demand for semiconductors, the market is expected to grow annually at a rate of between 5 and 10 percent. Utilizing the company’s process for new technology commercialization, MC will seek to establish alliances with strategic partners, such as those involved in technology licensing, in an effort to achieve practical applicability of the

technology at an early date.

\* Namely, the Miyoshi Lab, headed by Professor Takashi Miyoshi, and the Oshima Lab, headed by Professor Takumi Oshima.

### **Overview of Vitamin C60 BioResearch Corporation**

Address: Kyobashi Nisshoku Bldg. 5F, 1-8-7 Kyobashi, Chuo-ku, Tokyo

Capital: 100 million yen

Investment ratio: Mitsubishi Corporation 100%

Business: Ingredients for cosmetics utilizing fullerene; research and development of other products that utilize fullerene

President: Kenji Matsubayashi

Chart 1: The molecular structure of super-hydrated fullerene—C60 (OH) 40

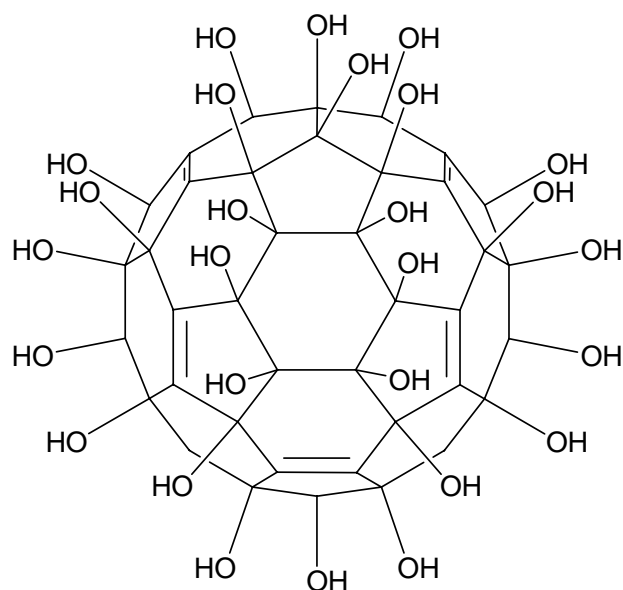


Chart 2: Polishing Time and Level of Evenness (RMS)

Time (sec.) \*Range of measurement

