

Technology Validation for Collection and Inactivation of Toxic Waste from CMP Processes

The technology has the potential to prevent release of toxic chemicals produced by the chemical mechanical polishing (CMP) process.

Keywords: semiconductor industry, CMP waste, slurries, arsine, nanoparticles

Process Implementation Readiness



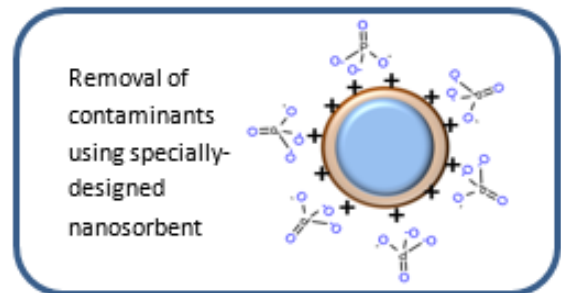
Background and Technology Description

The semiconductor industry is one of the largest industrial sectors worldwide and in New York State. Chemical mechanical polishing (CMP) stations are responsible for significant toxic emissions, waste generation, and water consumption. A typical semiconductor plant uses between 4.088×10^8 m³ and 5.223×10^8 m³ of ultrapure water annually and produces approximately 24,000 ton/year of sludge. The CMP waste contains numerous chemicals and can include toxic arsine and phosphine, oxidizing agents like hydrogen peroxide, corrosion inhibiting agents and solid particles like silica, ceria and alumina, which, depending on the CMP process/wafer used, can have surface adsorbed arsenic (As) and gallium (Ga) species.

Researchers at Clarkson University have developed 1) environmentally-friendly CMP processes that can prevent the formation of phosphine and arsine and facilitate the removal of inorganic nanoparticles from the polishing processes, 2) a method to capture and remove toxic components from CMP waste, and 3) a toxicity map for predicting the environmental impacts of CMP materials and waste.

Technology Benefits and Value

- Improved technologies to prevent toxic gas evolution and minimize the release of particles and toxic constituents in CMP waste.
- A system for capturing and removing nanoparticles from CMP polishing operations.
- A laboratory prototype for the removal of CeO₂ particles.



Target Customers

Semiconductor industry, and any location where slurry formulation and waste removal take place to minimize worker exposure.

Intellectual Property

The technology (device, method and system for nanoparticle capture, tracking and detection) has been patented and is available for licensing:

E.S. Andreescu, A Othman, Functional platform for rapid capture and removal of nanoparticles, Patent # 10179732, date of patent: Jan 15, 2019 (<https://patents.justia.com/patent/10179732>).

Opportunity

NYSP21 and Clarkson are interested in working with qualified parties for continued technology development and product commercialization.



Dr. Eugene Park, Assistant Technical Director | nysp21.rit.edu | 585-475-2512

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