

### Industrial Applications

Poly(Acrylic Acid), PAA, is an acid functional acrylic polymer that has many industrial uses. Its polarity and water solubility make it uniquely suitable for water treatment processing, particularly as a flocculant. It also finds use as a pigment dispersing and suspending agent due to these traits.

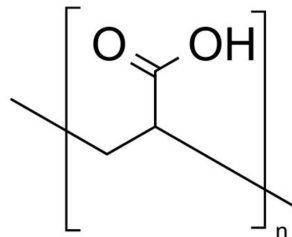


Figure 1: Chemical structure of Poly(Acrylic Acid)

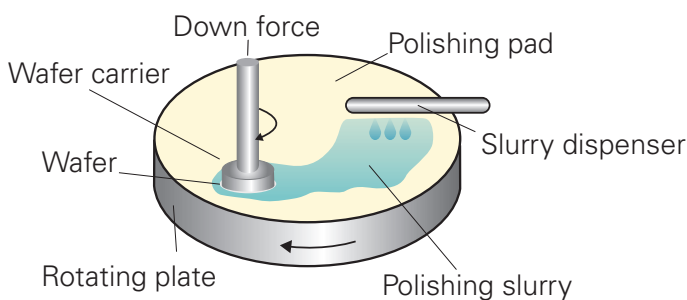


Figure 2: Basic CMP Process

### Electronics Application of PAA

During the processing of silicon wafers as semiconductors, a critical step is the flattening and levelling of the wafer. Chemical Mechanical Polishing, or CMP, is the process to produce an extremely flat, level and smooth wafer surface. Typical flatness values for the surface are generally under 20 nm from the high to the low points.

CMP is performed using an abrasive grinding agent comprised of a slurry of various nanoparticle-sized metal oxides dispersed in liquid media.

Because of its good pigment dispersion properties, PAA is a potential liquid media for making such slurries. However, a key requirement for the CMP slurry is that it have very low ion levels, particularly of Sodium and Chlorine, among others. Anything above minimal ion levels would be unacceptable due to interference with the electrical properties of the silicon wafer. Industrial grade PAA contains high levels of such ions, making it unsuitable for use as a CMP slurry media.

### Electronics Grade Manufacturing

To provide specialized grades of PAA suitable for use in electronics industry CMP slurry materials, Polysciences has developed manufacturing processes that yield highly purified PAA. Our proprietary methods produce low ionic content, low particulate content, stringently purified PAA that is highly useful as a CMP slurry dispersant.

Polysciences offers several grades of purified PAA at different molecular weights, including some with “non-detect” ion levels when tested by ICP-MS.

**Table 1:** Polysciences' premier purified PAA products

Cat. Code	Molec. Wt., K	Solids%	Viscosity, cSt	pH	Conductivity mS	Sodium Ions ppm	Chloride Ions ppm	Features
14433	2	32	8	2.0	1	2	1	Extremely low ionic content through a very wide range of elements. Extremely low conductivity.
14176	2	32	8	2.0	< 14	5	4	Low ionic content for Sodium, Potassium, and Chloride. Low conductivity
13511	10	30	30	2.0	10	10	2	Low ionic content for Sodium, Potassium, and Chloride.

### Polysciences PAA Manufacturing Capabilities

Polysciences' processing capabilities yield PAA lot sizes ranging from 1 kg – 1,000 kg. Our processes allow the preparation of PAA with tailored properties to meet the requirements of your specific applications.

We are pleased to offer our scientific and technical expertise, strong ISO 13485:2016 Quality Management System and cGMP capabilities to our partners in the electronics industry. Please reach out to us to find out how we can put our decades of knowledge and real-world experience to work for you.

### References

Park J-H, Cui H, Cho J-Y, Hwang H-S, Hwang W-J, Paik U, Kang H-G, Kwak N-J, Park J-G. (2010) *Multiselectivity chemical mechanical polishing for NAND flash memories beyond 32 nm*. J Electrochem Soc. 157(6):H607-H612.

Mesbahi AH. (2015) *Adsorption behaviour of polyacrylic acid on cerium oxide nanostructures: Experimental and predictive model*. (Publication No. 5172) [Master's Thesis, University of Central Florida]. <https://stars.library.ucf.edu/etd/5172>

Srinivasan R, Dandu PVR, Babu SV. (2015) *Shallow trench isolation chemical mechanical planarization: A review*. ECS J Solid State Sci Technol. 4(11):P5029-P5039.

Singh RK, Bajaj R. (2002) *Advances in chemical-mechanical planarization*. MRS Bulletin. 27(10):743-751.

### ORDERING INFORMATION

Cat. #	Description
14433-B	Poly(Acrylic Acid) Ultrapure MW 2000
14176-B	Poly(Acrylic Acid) Ultrapure MW 2000
13511-B	Poly(Acrylic Acid) Ultrapure MW 10,000

*See table 1 for specifications*

Visit [Polysciences.com](https://www.polysciences.com) anytime to place an order or inquire about custom formulations.