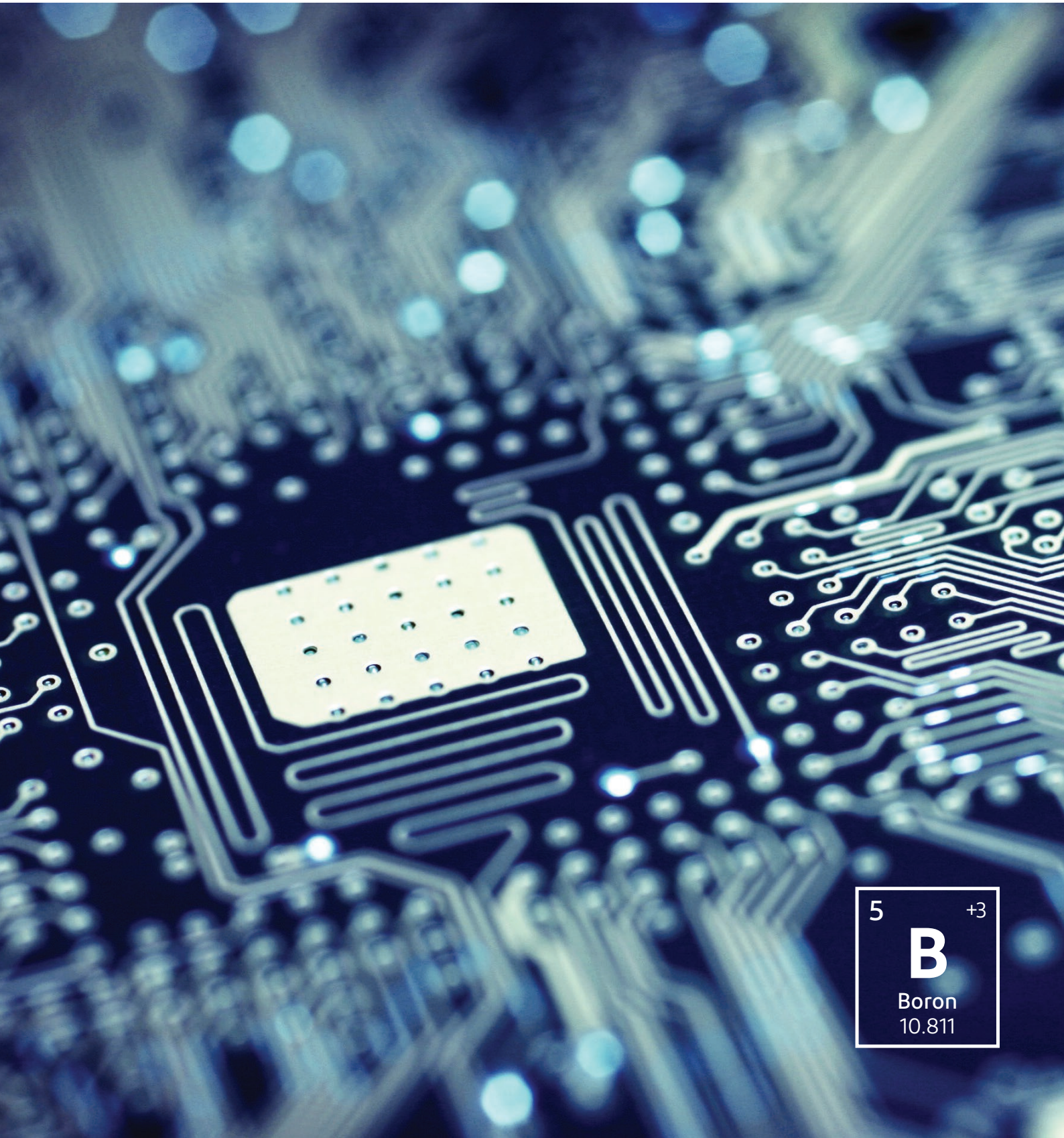
Water Solutions

DuPont™ AmberTec™ UP7530 Semiconductor Grade Boron Selective Ion Exchange Resin



Background

Boron is widely presented in nature, including water environment, such as seawater, surface water and ground water. High boron concentration in water could have negative impact on plant growth and human health. For microelectronics industry, even a small concentration of boron can create issues for ultrapure water (UPW) systems and product yield at the manufacture line. Most integrated circuit (IC) manufacturers require boron concentrations to be lower than 20ppt and even lower than 1 ppt for some latest advanced technologies.

Semiconductor grade Boron Selective ion exchange Resin (BSR) is a better solution to solve challenges brought by boron that is troubling the IC industry today.

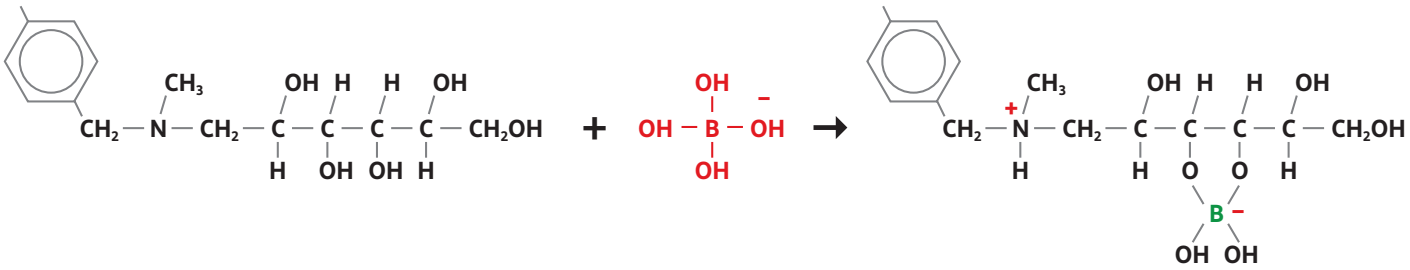
Solution from DuPont

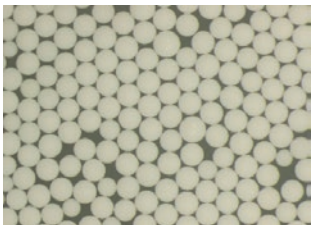
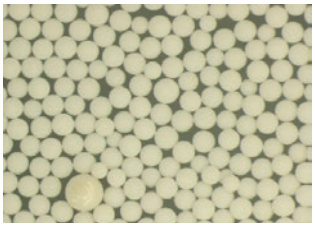
For many years, DuPont Water Solutions has been putting a lot of effort to improve and invent BSR products. Back in 1957, Rohm & Haas developed the N-Methyl Glucamine (NMG) resin and patented the process. Dow developed the uniform NMG resin in the following years (Both Rohm & Haas and Dow IER business are now DuPont Water Solutions).

Borate can make a very stable complex with the methyl glucamine functional group on BSR resin while other anions do not react allowing borate to be removed and held very tightly in the presence of other anions.

Currently, drinking water grade BSR DuPont™ AmberLite™ PWA10 and industrial grade BSR DuPont™ AmberSep™ IRA743 are widely recognized by customers with excellent performance. But they are not applicable for the polishing loop at the UPW system due to the strictest requirements on TOC leachable and resistivity.

To meet increasing demand for semiconductor grade BSR product, DuPont Water Solutions developed the DuPont™ AmberTec™ UP7530 which is a uniform semiconductor grade BSR. AmberTec™ UP7530 was evaluated and qualified at lab, pilot scales demonstrated excellent performance which allowed its adoption in full scale plant designs.



Product	AmberTec™ UP7530	AmberSep™ IRA743
	Semiconductor grade uniform	Industrial grade Gaussian
Type		
Particle Diameter	490 – 590 µm	500–700 µm
Uniformity Coefficient	≤1.1	≤1.6
ΔTOC, 24 h	≤ 5ppb	NA
Resistivity, 24 h	≥ 15 MΩ•cm	NA

Key Features and Benefits to Customers

The semiconductor grade BSR DuPont™ AmberTec™ UP7530 is designed to meet the purest quality and produced by the most stringent manufacturing process for the UPW polishing loop. It can be used to remove boron to trace level with acceptable delta TOC and resistivity. Compared to the current, widely used boron removal process with a semiconductor grade anion (like AmberTec™ UP4000), AmberTec™ UP7530 is expected to have much higher operating capacity which will enable the simplification of the boron removal system design and allow for more reliable performance than with the current system using an anion resin.

As a tailored semiconductor grade BSR for UPW polishing loop, it has the following key features and benefits to customers:

Key features	Benefits to customers
Ready to use without further post treatment with chemicals at site	• Easy to handle. • No chemicals consumption and environment friendly
Extraordinarily lower TOC leachable and higher resistivity to enable much shorter rinse down time	• Shorten the debugging time for new projects • Quickly reach normal operation for replacement projects
Uniform bead size	• More reliable performance due to the higher operating capacity • Better Hydraulic properties including lower pressure drop

Figure 1: Pressure Drop
Temperature = 10–60°C (50–140°F)

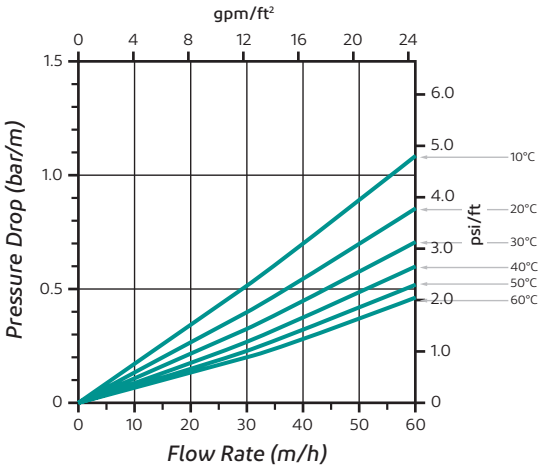
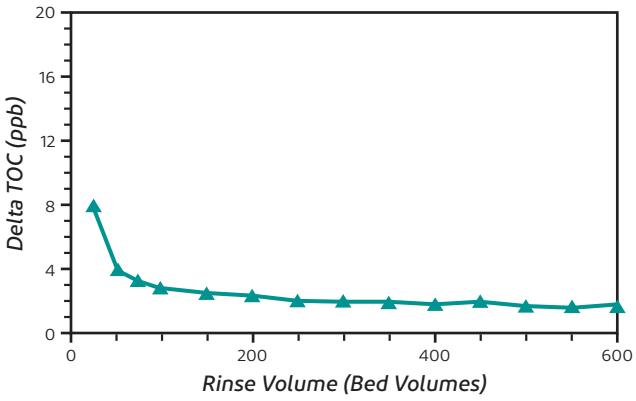


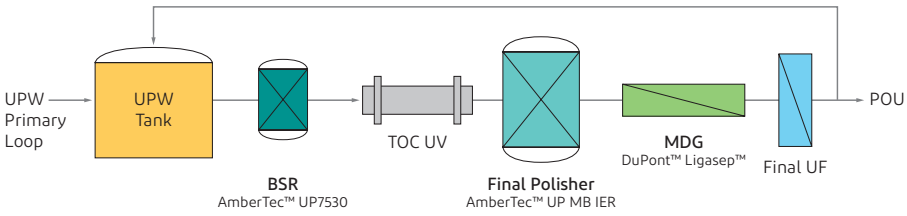
Figure 2: TOC Rinse Performance



Recommendation on Application Scenarios

For New UPW Systems

Recommendation	Advantages
Design BSR column with AmberTec™ UP7530 before TOC UV	• Meet the most stringent Boron requirement • More stable performance under make-up water quality fluctuation • Longer lifetime for final polisher

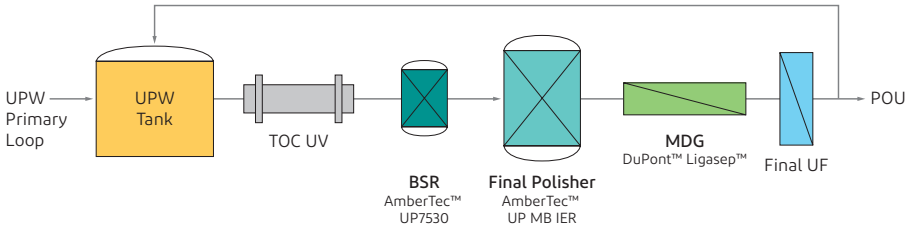


For Existing UPW Systems

For existing UPW systems which are facing the issues because of boron, such as effluent boron fluctuation, failure to meet the effluent boron requirement and frequent rebed of final polisher due to boron leakage, DuPont™ AmberTec™ UP7530 would be a good solution to fix those kinds of issues. Due to the complexity of UPW systems, installing AmberTec™ UP7530 into an existing UPW system needs to be thorough assessed based on the polishing system design, UPW final quality requirement and other related factors. Consulting DuPont technical experts for advice when needed. There are some potential scenarios as below.

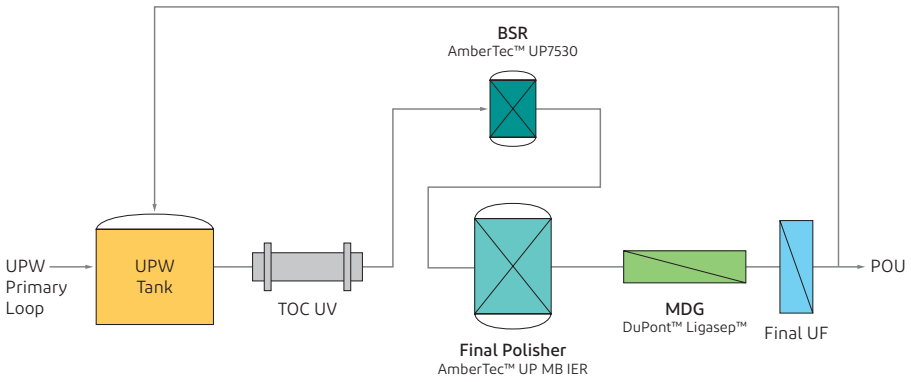
Scenario A: UPW polishing system with anion polisher for boron removal

Recommendation	Advantages
Replace or partially replace the polishing anion with AmberTec™ UP7530	• Improve the effluent quality and system stability under make-up water quality fluctuation • Lower replacement frequency (AmberTec™ UP7530 Vs polishing anion) • Longer lifetime for final polisher



Scenario B: UPW polishing system with multi-pass final polishers or standby final polisher

Recommendation	Advantages
Load AmberTec™ UP7530 in the standby column with retrofitting the pipes or load some AmberTec™ UP7530 in first final polishers	• Improve the effluent quality and system stability under make-up water quality fluctuation • Longer lifetime for final polisher



Recommended Operating Conditions

Recommended Operating Temperature	15 to 25°C (60 to 77° F)
Recommended Service Flowrate	40 – 60 BV*/h

Have a question? Contact us at: dupont.com/water/contact-us

DUPONT

dupont.com/water

Form No. 45-D02437-en CDP, Rev. 0
July 2020