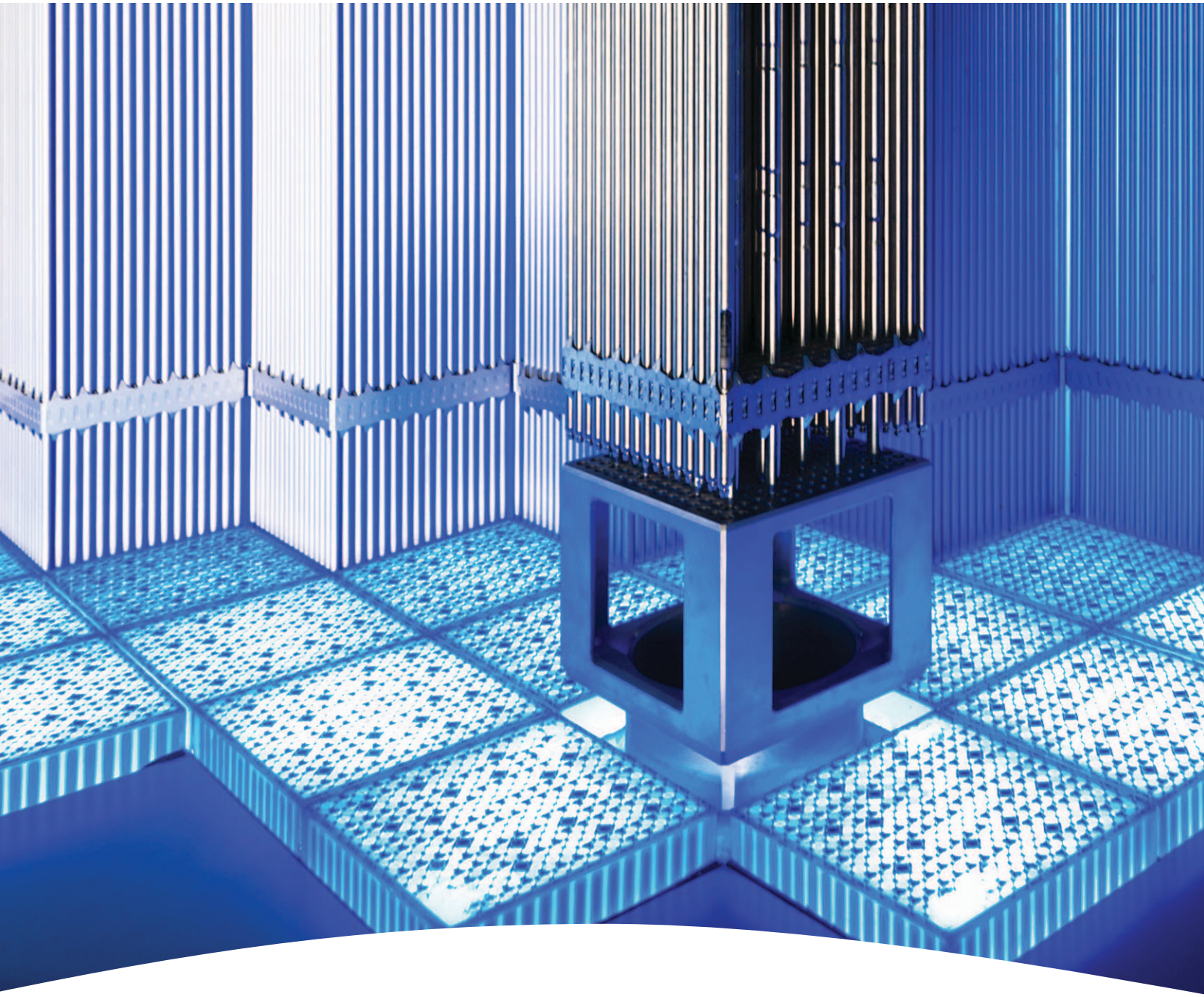
UOP IONSIV™ Selective Media



Efficient treatment of liquid nuclear wastes

UOP
A Honeywell Company

IONSIV Selective Media: A superior nuclear waste remediation product

Even in the most extreme conditions, UOP IONSIV products are proven to exhibit high capacity, selectivity and stability compared to ion exchange products available today.

UOP IONSIV Selective Media are microporous inorganic crystalline media used in the nuclear industry for more than 40 years. These materials provide unique combinations of selectivity, capacity and stability not available from other nuclear waste remediation products today.

UOP offers a portfolio of selective media including alumino silicates (zeolites) and crystalline silicotitanates to provide our customers with the ability to tailor a solution that will specifically address their needs.

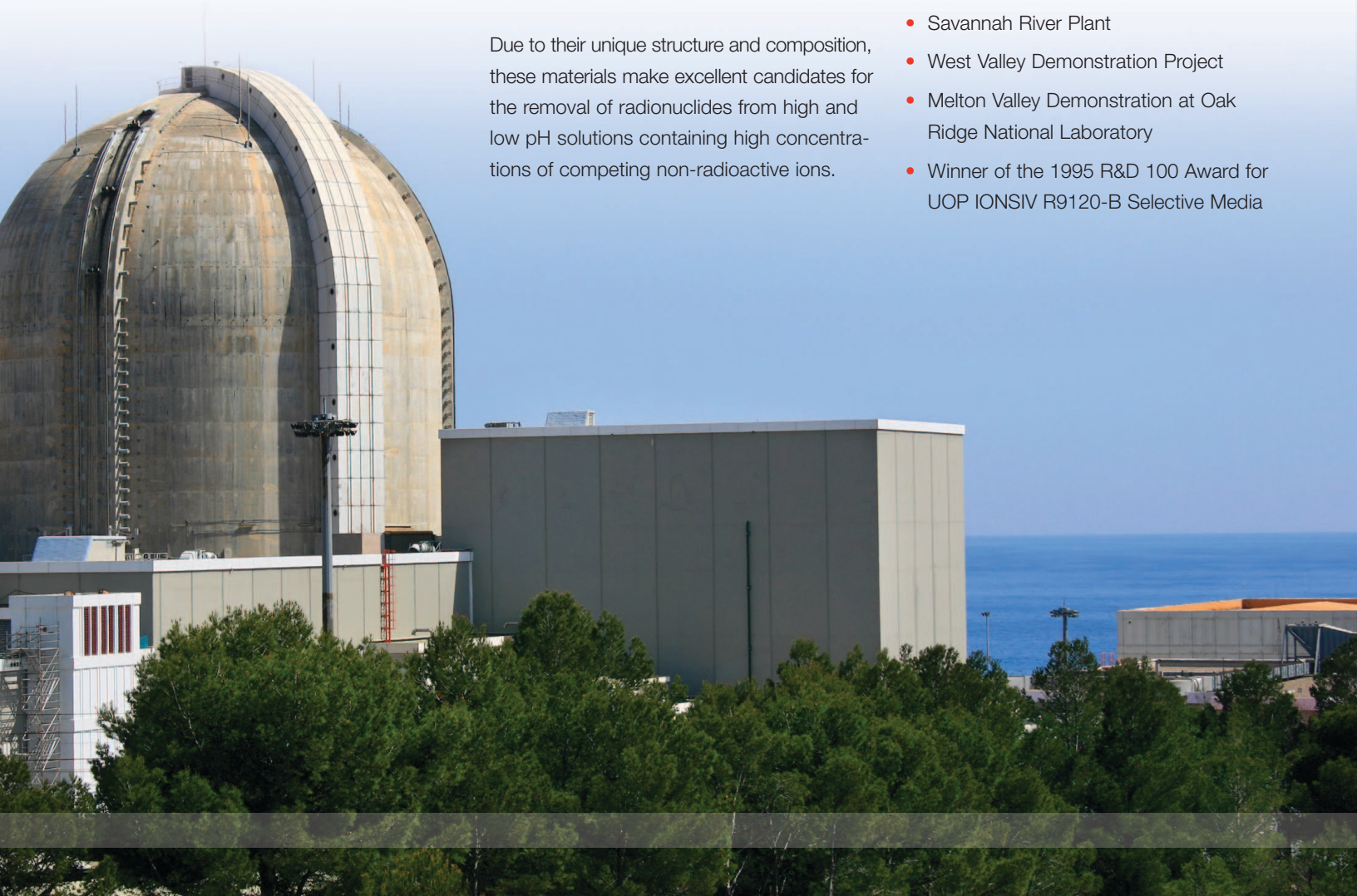
Due to their unique structure and composition, these materials make excellent candidates for the removal of radionuclides from high and low pH solutions containing high concentrations of competing non-radioactive ions.

Typical applications include:

- Removal of Cs and Sr from radwaste streams in commercial power plants
- Removal of Cs and Sr from nuclear reprocessing waste alkaline supernatant
- Removal of Cs from evaporator overheads
- Removal of Cs and Sr from nuclear fuel storage pool water

Proven experience and acclaim

- Fukushima Daiichi
- Three Mile Island
- Savannah River Plant
- West Valley Demonstration Project
- Melton Valley Demonstration at Oak Ridge National Laboratory
- Winner of the 1995 R&D 100 Award for UOP IONSIV R9120-B Selective Media



Superior performance

High Selective Media capacity and selectivity

IONSIV Selective Media commonly exhibit high selectivity and capacity for specific contaminants, even when high concentrations of competing ions are present. For example, UOP IONSIV R9120-B Selective Media exhibits a significantly higher capacity and shorter contact time for Cs compared with common organic resin and inorganic ion exchangers, as seen in Figure 1.

Each IONSIV Selective Media exhibits a different pattern of selectivity. Typical selectivity for exchange of various cations is provided in the Product Portfolio section.

Minimizes final waste forms

IONSIV Selective Media composition is compatible with final waste forms, such as glass and cement. This compatibility, combined with high selectivity, minimizes the quantity of final waste form produced.

Single-use media

As a single use media, UOP IONSIV products require no regeneration. This allows for the design of simpler and more economic processes leading to lower costs and higher reliability.

High radiation stability

Excellent retention of capacity and superior physical integrity, even in the presence of high levels of ionizing radiation, make IONSIV Selective Media particularly well-suited for the recovery and concentration of radioisotopes for long-term storage. Regeneration of IONSIV Selective Media is typically not required, eliminating secondary waste generation.

Excellent mechanical stability

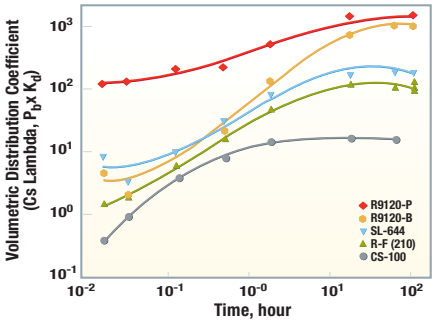
IONSIV Selective Media exhibit no change in volume on contact with waste solutions. Mechanical problems, which can result from swelling, often associated with organic resins, are eliminated. All IONSIV products are formulated with high resistance to attrition and dusting, making them suitable for applications involving slurry transfer of the media.

Superior chemical stability

IONSIV Selective Media retain their physical integrity and high selectivity over a broad pH range. See Figure 2 for an example of the high Cs distribution coefficient of R9120-B Selective Media over a wide pH range. An IONSIV product can often be matched with the demands of applications even at extremes of pH, as seen in Figure 3, which shows the uptake of Cs on R9120-B Selective Media over time in acidic conditions.

Figure 1

Cs kinetic data in simulant* comparing UOP IONSIV R9120 series Selective Media with organic resins



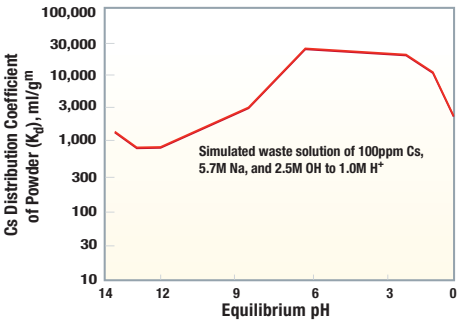
*= 70% 101-AW simulant = 5M Na, 1.0×10^{-4} Cs, initial Na/Cs = 5.0×10^4

CS-100	Commercial phenol-formaldehyde ion exchange resin
R-F (BSC-210)	Resorcinol-formaldehyde ion exchange resin
Superlig® 644	Macrocyclic ion exchange resin

(Data courtesy Sandia National Laboratories in collaboration with UOP)

Figure 2

Crystalline silicotitanates exhibit high Cs distribution coefficients



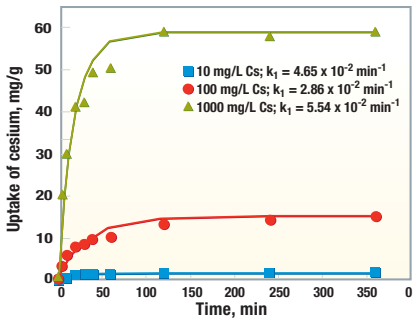
$$K_d = \frac{(C_0 - C_1)}{C_1} \times \frac{V}{M \times F}$$

Where: C_0 is the initial counts of the ion of interest in the feed solution before contact. C_1 is the counts after contact; V is the solution volumne in ml, M is the crystalline silicotitanates mass in grams, F is the mass of dry exchanger divided by the mass of wet exchanger.

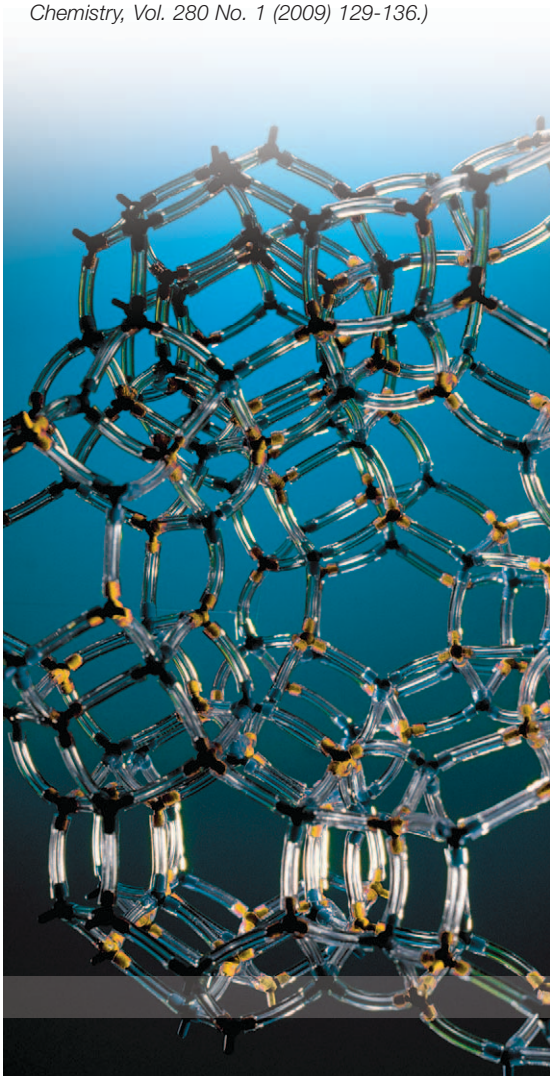
(Data Courtesy Sandia National Laboratories)

Figure 3

Uptake of Cs on IONSIV R9120-B Selective Media from nitric acid medium (3.0 M) with time



(Journal of Radioanalytical and Nuclear Chemistry, Vol. 280 No. 1 (2009) 129-136.)



UOP IONSIV Selective Media product portfolio



There are a variety of IONSIV Selective Media to meet your specific requirements. The relative cation selectivity of each product in order of decreasing selectivity is provided below.

IONSIV R9150 and R9160 Series

- Zeolites that exhibit a high selectivity for Cs
- Available as granules in two cation forms (R9150-G and R9160-G)
- Selectivity:
  Cs > K > Na > Li, Ba > Sr > Ca >Mg

IONSIV R9510 Series

- Zeolites exhibiting high selectivity for Sr
- Available as a powder (R9510-P) or granules (R9510-G)
- Selectivity:
  Sr > Ca > Na, Mg > K > Rb > Li > Cs

IONSIV R9120 Series

- Crystalline silicotitanates that exhibit the highest Cs capacities and selectivities
- Suitable especially for applications at pH extremes (as seen in Figure 2, which shows the Cs uptake over a wide pH range)
- Especially suitable in applications requiring maximum Cs selectivity and capacity as seen in Figure 1
- Crystalline silicotitanates also exhibit excellent Sr selectivity at neutral to alkaline pH and can therefore remove both Cs and Sr simultaneously within these conditions
- Available as a powder (R9120-P) or beads (R9120-B)
- Selectivity: Cs >> Na

Find out more

If you are interested in learning more, please contact your UOP representative or visit us online at www.uop.com.

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