

HONEYWELL
EFFICIENT TREATMENT OF LIQUID NUCLEAR WASTES

HONEYWELL IONSIV™ ADSORBENTS

Honeywell

IONSIV™ ADSORBENTS: A SUPERIOR NUCLEAR WASTE REMEDIATION PRODUCT

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

Honeywell IONSIV™ Adsorbents 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.

Honeywell 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." to "Due to unique structure and composition, Honeywell IONSIV™ Adsorbents are an excellent solution to remove radionuclides from high- and low-pH fluids 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 waterd

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 IONSIV™ R9120-B Adsorbent



SUPERIOR PERFORMANCE

Honeywell IONSIV™ Adsorbents offer high capacity and selectivity

Honeywell IONSIV™ Adsorbents commonly exhibit high selectivity and capacity for specific contaminants, even when high concentrations of competing ions are present. For example, Honeywell 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™ Adsorbent 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™ Adsorbents are 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, Honeywell 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 Honeywell IONSIV™ Adsorbents particularly well-suited for the recovery and concentration of radioisotopes for long-term storage. Regeneration of Honeywell IONSIV™ Adsorbents is typically not required, eliminating secondary waste generation.

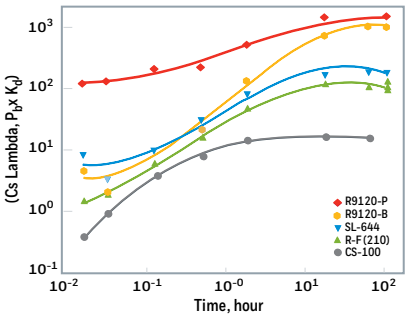
Excellent mechanical stability

Honeywell IONSIV™ Adsorbents 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

Honeywell IONSIV™ Adsorbents 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 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 over time in acidic conditions.

FIGURE 1
Cs kinetic data in simulant* comparing Honeywell IONSIV™ R9120 series IONSIV™ Adsorbents with organic resins

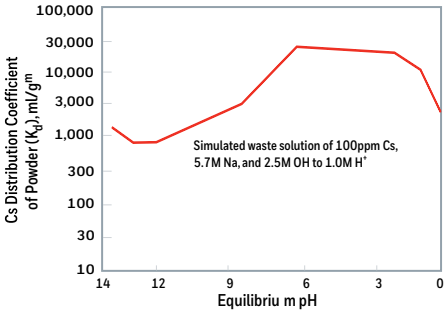


*= 70% 101-AW simulant = 5M Na, 1.0x10^{-4} Cs, initial Na/Cs = 5.0x10^4

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

(Data courtesy Sandia National Laboratories in collaboration with Honeywell)

FIGURE 2
Crystalline silicotitanates exhibit high Cs distribution coefficients

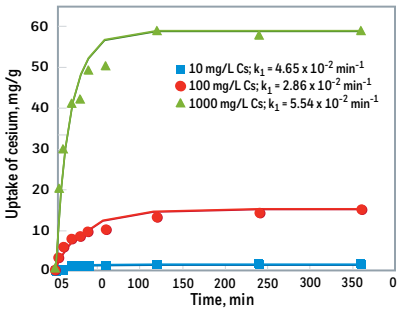


$$K_d = \frac{(C_0 - C_1)}{C_1} \sim \frac{V}{M \times F}$$

Where C_0 is the initial counts of the ion of interest in the feed solution before contact. C_2 is the counts after contact: V is the solution volume 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 from nitric acid medium (3.0 M) with time



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HONEYWELL IONSIV™ ADSORBENT SOLUTIONS

Honeywell IONSIV™ Adsorbent solutions are offered as the IE-911 and the IE-96 product families

IONSIV™ IE-911 crystalline silicotitanate product line, which offers Cs-ion removal solutions requiring highest capacity and selectivity. IE-911 products are specifically designed for applications at pH extremes, offer exceptional stability and durability. IONSIV™ IE-911 solutions are also effective at Sr-ion removal, especially at neutral to alkaline pH. The ability to remove both Cs and Sr simultaneously offers additional cost savings and flexibility for the total adsorption system design. The IE-911 product line includes:

- **IONSIV™ R9120-B** is a highly selective adsorbent for removal of Cs- and Sr-ions from fluids with a wide pH-range
- **IONSIV™ R9140-B** is a highly selective adsorbent for removal of Cs-ions from high-pH fluids

IONSIV™ IE-96 alkali metal aluminosilicate product line offers Cs-ion removal over a wide pH-range and is effective for recovery and storage of radionuclides from aqueous solutions.

- **IONSIV™ R9160-B** is a highly selective adsorbent for removal of Cs from aqueous fluids

Both Honeywell IONSIV™ IE-911 and IE-96 products are shipped in 55-gallon steel drums.



For more information
www.honeywell.com

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