

Nuclear Grade Carbon & Silver Zeolite Cartridges used for the assay of Radioiodine



Background information on Radioiodine Testing:

For evaluation and documentation purposes, HI-Q has all of its individual batches/lots of TEDA Impregnated Carbon and Silver Impregnated Zeolite collection media tested by an outside certified testing laboratory, at multiple flow rates in the cartridge configuration. Samples of each mesh size and batch/lot are tested in the most common cartridge configuration over a wide range of sample flow rates. Historical test data has allowed HI-Q to plot typical collection efficiency curves that will help you the customer in selecting that product which will best suit your analytical needs.

Why test?

Collection efficiency tests on adsorption media such as TEDA Impregnated Carbon and Silver Impregnated Zeolite, are important indicators of what one might expect to collect in actual use.

What effects collection of iodine?

Iodine usually is found as sublimed volatilized Iodine. This specie will condense on almost any surface or dust particle and will always have very high collection efficiency.

Methyl Iodide is used for standard testing because it is the smallest organo-molecular form of Iodine and is gaseous at ambient temperature. Because it is gaseous, it can be used to test the collection efficiencies on a "worst case scenario" basis. Methyl Iodide is not normally found in nature, or as a by-product of nuclear power generation.

What test conditions are used?

The standard industrial test procedure is: ASTM D-3803-98, with test conditions of P=1ATM, T=30°C, Velocity=40 ft/min, R.H.=95%, CH₃I concentration=1.75 mg/M³, Pre-Equilibration = 18 hours, Pollutant load = 1 hour, Elution = 1 hour. The nuclear industry uses these test procedures for comparative testing of collection media.

Awareness of environmental collection conditions.

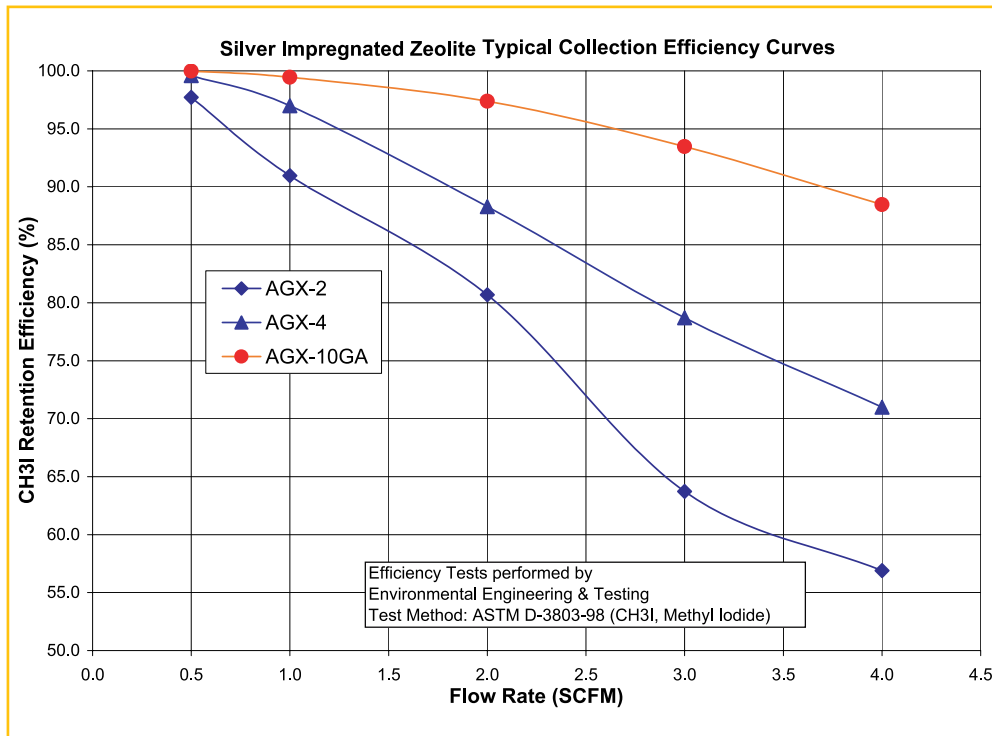
Environmental scientists will not normally use the analytical cartridges under the specified ASTM conditions, but rather at the conditions found at the sampling site. For example, the sample cartridge will be used immediately in the air sampler and not swept with inert gas, or pre-equilibrated for 18 hours. The iodine loading rate or concentration cannot be controlled. Nor does one have control of the sampled environmental air conditions such as temperature and relative humidity. The environmental scientist should be aware that air sampling for radioiodine is strongly affected by: The species of Iodine, flow rate (face velocity), collection media, mesh size of the selected media, relative humidity, temperature, and sampling duration.

Flow rate

As a general guideline, and per the U.S. Department of Energy in their publication Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance (DOE/EH-0173T), "the linear flow rate across particulate filters and charcoal cartridges should be maintained between 20 and 50 m/minute (DOE/EP-0023)."

Silver Impregnated Zeolite Cartridges

The "AGX" Series, Silver impregnated Zeolite Cartridges contain a highly efficient inorganic adsorbent for the collection and removal of elemental and organic forms of radioactive Iodine. Laboratory test indicate that radioactive Xenon, Krypton, and other Noble Gases are not retained to any significant degree by Silver impregnated Zeolite cartridges (approximately 1/15,000th, or less, than that retained by activated Carbon). The media is nonflammable and operates at a very high efficiency at elevated temperatures. These cartridges are the preferred and specified type for use in post accident standby monitoring systems. All AGX-Series cartridges are individually heat-sealed in an airtight 6-mil polyethylene package to prevent contamination before use.



Ordering Information

Order	Cartridge Series	Dimensions	Silver Zeolite Mesh Size
AGX-2	AGX	2¼" x 1" Plastic Cartridge	16 x 40 Mesh
AGX-4	AGX	2½" x 1" Metal Can Cartridge	16 x 40 Mesh
AGX-10GA	AGX	2½" x 1½" Metal Can Cartridge	16 x 40 Mesh

Note: additional custom mesh sizes available: 30 x 50 and 50 x 80



TC-08 TC-Series TCAL-Series TCGA-Series

Radioactive Noble gas

“What is the retention efficiency of Radio Iodine or Xenon on Carbon and Silver Zeolite?” The reason the question is asked, is because ¹³³Xe is also a by-product of nuclear fission. In the Journal of Health Physics, it is stated that when Carbon and Silver Zeolite are dosed with ¹³³I and ¹³³Xe, tests show that 0.03 to 0.5% of the original concentration of ¹³³Xe will be retained on 40x50 mesh TEDA impregnated carbon. Silver impregnated Zeolite was found to have retained 1/15,000th the amount of ¹³³Xe as that of the Carbon. The lower the retention or capture of ¹³³Xe on a collection media such as silver zeolite, the lower the possibility of misinterpretation of collected radioactivity as being attributed to anything other than the iodine species.

HI-Q stands for High Quality!

HI-Q manufactures all of its cartridges under an ISO 9001:2008 certified quality assurance program (see web site for a copy of HI-Q’s certificate). Following the set procedures set forth in their Quality Assurance Program ensures repeatable performance and dimensions of each cartridge manufactured by HI-Q Environmental Products Company. *HI-Q specifically has each individual lot of carbon and silver zeolite, from which the individual cartridges are made, randomly tested and certified by an independent testing laboratory, at multiple sample flow rate points through the most common geometry of cartridges utilized in the nuclear industry. The Lot-Specific test results are included with each customer order.*

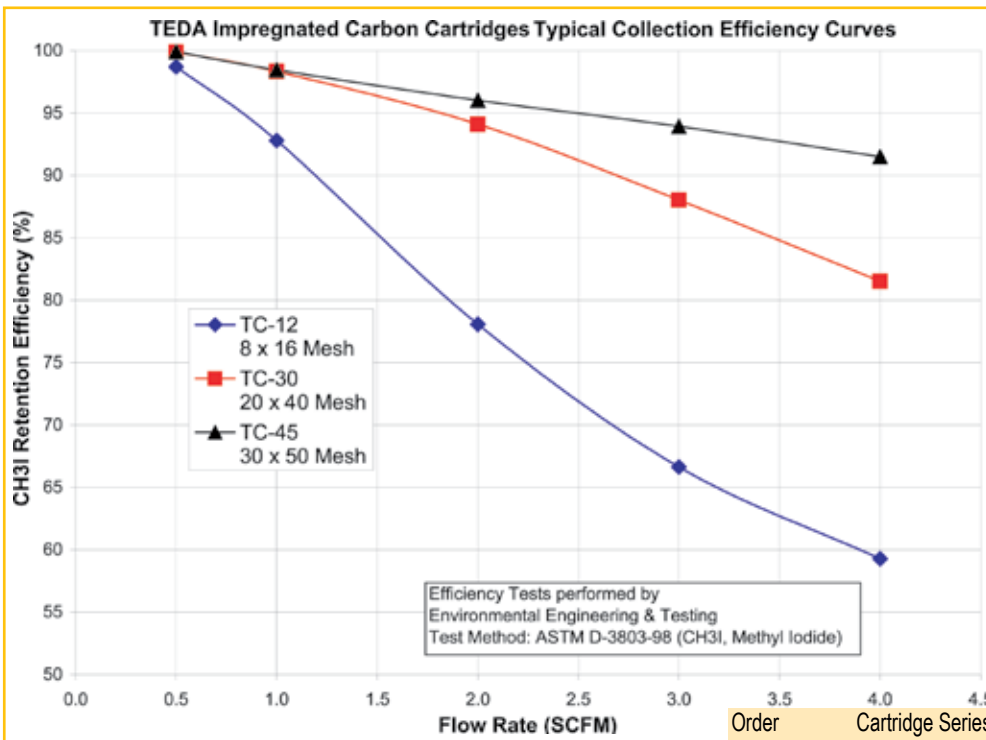
The individually labeled cartridges are heat-sealed in air tight 6 mil polyethylene packages or sleeves. Silver Impregnated Zeolite cartridges are packaged individually and TEDA Impregnated Carbon cartridges are packaged in sleeves of 10. Custom packaging configurations are available upon request. Shelf life of the sealed cartridges as defined by the industry is 10 years.

What mesh size media should you use?

HI-Q has three mesh sizes of impregnated Carbon available. They are: 8 x 16, 20 x 40 and 30 x 50 Mesh. These three Mesh sizes are made available because sampling requirements vary, depending on, flow rate, sampling duration, sampling equipment type, Iodine specie, etc. As a rule, the smaller the physical mesh size (i.e. 30 x 50), the higher the Iodine retention efficiencies, but the greater the pressure drop through the filter cartridge (smaller size materials present a greater surface area allowing higher gas to surface contact). Because of the high pressure drop, it is recommended however that the very fine 30 x 50 Mesh cartridges only be used in positive displacement pump systems, NOT high volume centrifugal fan or battery operated pump samplers.

TEDA Impregnated Carbon Cartridges

TEDA (triethylene di-amine) impregnated Carbon filter media has a high affinity for the adsorption, chelation and retention of the various species of Iodine. The HI-Q Environmental Products Company manufactures a number of configurations of activated carbon cartridges to fit almost all industry standard cartridge holders. The most common size in the industry is the 2¼” dia. x 1” thick unit. These are HI-Q’s “TC-Series” cartridges. This cartridge container is made of radiation yellow, high density polypropylene which is chemically inert, with a spun polypropylene retainer. The cartridges are easily cut open for analysis. Other popular HI-Q cartridge configurations, are the 2½” dia. x 1” (TCAL-Series), and the 2½” dia. x 1½” (TCGA-Series) metal can configuration commonly used in post accident monitors. All cartridges are heat-sealed in an airtight 6-mil polyethylene package to prevent contamination before use. The unopened package has an industry accepted ten-year shelf life. Ten cartridges are contained in each package/sleeve. Custom packaging is available with no minimum order.



Ordering Information

Order	Cartridge Series	Dimensions	Carbon Mesh Size
TC-08	TC	1-5/8" x 3/4" (for personnel Air Samplers)	8 x 16 Mesh
TC-12	TC	2¼" x 1" Plastic Cartridge	8 x 16 Mesh
TC-30	TC	2¼" x 1" Plastic Cartridge	20 x 40 Mesh
TC-45	TC	2¼" x 1" Plastic Cartridge	30 x 50 Mesh

Order	Cartridge Series	Dimensions	Carbon Mesh Size
TCAL-12	TCAL	2½" x 1" Metal Can Cartridge	8 x 16 Mesh
TCAL-30	TCAL	2½" x 1" Metal Can Cartridge	20 x 40 Mesh
TCAL-45	TCAL	2½" x 1" Metal Can Cartridge	30 x 50 Mesh
TCGA-12	TCGA	2½" x 1½" Metal Can Cartridge	8 x 16 Mesh
TCGA-30	TCGA	2½" x 1½" Metal Can Cartridge	20 x 40 Mesh
TCGA-45	TCGA	2½" x 1½" Metal Can Cartridge	30 x 50 Mesh