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Preconcentration of cesium-137 (^{137}Cs) from large volume water samples using zirconium ferrocyanide embedded on cartridge water filters

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The determination of cesium-137 (^{137}Cs) in surface waters usually requires some form of preconcentration prior to radiometric analysis. There are many types of inorganic sorbents suitable for this application including ammonium molybdophosphates (AMP), natural and synthetic zeolites, and ferrocyanides of transition metals. Ferrocyanides are relatively easy to prepare and generally provide high selectivity for separation of cesium in the presence of alkaline and alkali metals. This paper describes a method for preparing a zirconium ferrocyanide (ZrFeCN) based sorbent material that is conveniently embedded on a polyethylene wound water filter cartridge (0.5 μm Micro-Wynd[®], Cuno Inc.). These ZrFeCN based sorbent cartridges have been used extensively at former nuclear test sites in the Marshall Islands for preconcentration of ^{137}Cs in water samples collected on plate lysimeters. At pump rates of < 2 liters per minute, the ZrFeCN cartridge collections exhibit a very high efficiency for cesium uptake (>95%) and good stability for long-term, automated field applications. The use of a synthetic support base (in this case, polyethylene) for the sorbent was preferred over more commonly used natural cotton materials because of its lower ^{137}Cs background and ash content.

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