Quantum
Filtration Medium

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RE: Removal of Arsenic from Drinking Water by Precipitation, Adsorption and DMI-65

In the case of drinking water treatment where the requirement is to reduce arsenic to a few parts per billion, the applicable technologies are limited. This letter mentions briefly the aqueous inorganic chemistry of arsenic and the common method that has been successfully applied commercially in the water treatment industry. Low cost removal of arsenic from drinking water is likely to be confined to precipitation and adsorption, and then where the Quantum material DMI-65 is used as the catalytic material to filter the arsenic precipitates.

PRECIPITATION OF ARSENIC

The most common methods of removing arsenic from aqueous process streams are by precipitation as ferric arsenate. Arsenic(V) can also be precipitated from process solutions below about pH=2 with iron(III) to form ferric arsenate, FeAsO4.2H2O, which is white to very pale green in colour.

Iron (II) arsenates are less soluble and more stable in the neutral pH region than ferric arsenate. Iron(II) arsenate is of particular interest as a low solubility material and this compound has recently been the basis of a process developed and successfully demonstrated in a variety of applications. The Fe(II)-Fe(III) hydroxy sulfate (known as "green rust") has been shown to incorporate arsenic into the structure at pH<7.

ADSORPTION OF ARSENIC ON FERRIHYDRITE

Over many years there has been much attention directed to the removal of arsenic from hydrometallurgical process solutions and waste waters by precipitation and co-precipitation with iron(III).

Various complexes are formed in the adsorption of As(V) on ferrihydrite; at pH>7. Arsenic(V) is adsorbed to ferrihydrite as a strongly bonded inner-sphere complex. However the optimal adsorption of arsenic(III) on ferrihydrite occurs at pH 8-9.

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DMI-65 Catalytic Filter Media

So it is understood by introducing a flocculating agent such as ferric chloride solution at concentration ratios of up to 50 parts ferric chloride as iron to one part arsenic will overwhelm the arsenic and causing the arsenic and iron to form a complex. We use FeCl3 to form a bond with Arsenic, and as DMI-65 has a high efficiency of iron removal, it is possible to remove the arsenic through the retention of precipitated arsenic that has formed a complex with iron introduced from the ferric chloride.

Overall, Quantum's knowledge based on results from the attached two attached reports indicate that the DMI-65 is very successful in removing arsenic and possible to undetectable limits. Note performance increases with the increase in iron content in pre-treated water and decreased with the increase in flow rate.

DMI-65 needs no regeneration. The catalytic surfaces of the DMI-65 have oxidating and attracting properties for the Fe-As. The role of chlorine is to keep these catalytic surfaces of the DMI-65 clean and in a constant state of catalysis with precipitated metals. So it is necessary to dose chlorine in the feed and in the BW to give only a very small free chlorine residual of 0.1. DMI-65 is safe for drinking water and certified by the Water Quality Association NSF/ANSI-61 for drinking water components. DMI-65 makes no complexes or leaches no contaminates in to the feed water.

** See the attached report on Arsenic test Results Prepared by Dr Magda Wajrak of the Edith Cowan University, Joondalup Campus, WA

*** See the attached Arsenic Removal Test by Peter Hutchison BSc. (Chemistry) 30th January 2004 – showing DMI-65 removing arsenic to undetectable levels.

Regards

James Glaskin

Quantum Filtration Medium Pty Ltd

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COMMON SEAL

Company stamp: