Mercury Controls and Removal in Bauxite Refining

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> Removal of mercury from an alumina refinery aqueous stream - ResearchGate. Available from: http://www.researchgate.net/publication/6673902_

Digestion slurry often enters a series of "Flash tanks" to cool the slurry, pressure reduction, and heat recovery. Mercury is often found at this stage

COMMON SOURCES:

> Oxalate removal if sent to downstream furnace for lime removal
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> Traps on condensers and heat exchangers
>
> Precipitate from digestion condensates
>
> Calciner stack gases

Mercury Control Approaches

Bauxite contains trace quantities of mercury, which can give rise to elemental mercury vapor, especially in the upstream part of the refining process—typically in the digestion area. Some refineries use condensers to remove mercury from vapor. Occasionally, collections of metallic mercury are encountered and removal is undertaken by trained staff using safe handling measures and appropriate personal protective equipment

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4131932/

Sorbents:

1. The Bayer refining process can generate flue gases that contain elemental mercury, volatile organic carbons (VOCs) and water vapor creating a unique and challenging environment for the development of mercury adsorption technologies. Three sulfur impregnated activated carbons (SIACs) were tested under a range of conditions to assess each as a potential candidate for use in pilot scale fixed bed adsorber trials.All materials tested met or exceeded the mercury loading capacities specified by the respective suppliers and were therefore not significantly impeded by the addition of toluene into the gas phase. Of the SIACs, Pica/Alcoa Selexorb HG showed the lowest affinity to adsorption of organic vapors (toluene) and the highest affinity to the adsorption of mercury vapors (over a wide range of operating temperatures). Alcoa/Pica Selexorb HG is the preferable sulfur impregnated carbon for the removal of mercury vapors and is recommended for use in pilot trials.

2. Digestion condensate is formed as a by-product of the alumina refinery digestion process. The solution exhibits a high pH and is chemically reducing, containing many volatile species such as water, volatile organics, ammonia, and mercury. Because digestion condensate is chemically unique, an innovative approach was required to investigate mercury removal. The mercury capacity and adsorption kinetics were investigated using a number of materials including gold, silver and sulphur impregnated silica and a silver

impregnated carbon. The results were compared to commercial sorbents, including extruded and powdered virgin activated carbons and a sulphur impregnated mineral. **Nano-gold supported on silica (88% removal under batch conditions and 95% removal under flow conditions) and powdered activated carbon (91% under batch conditions and 98% removal under flow conditions) were the most effective materials investigated**. The silver and sulphur impregnated materials were unstable in digestion condensate under the test conditions used

Source: Chemical Engineering Journal (Impact Factor: 4.32). 11/2012; s 211–212:133–142. DOI: 10.1016/j.cej.2012.09.098 School of Applied Sciences (Applied Chemistry), RMIT University, PO Box 2476V, Melbourne 3001, Australia. Journal of Hazardous Materials (Impact Factor: 4.33). 07/2007; 144(1-2):274-82. DOI: 10.1016/j.jhazmat.2006.10.041

3. **Sulphur impregnated activated carbons (SIAC) in mercury adsorption-**

   http://sciencewa.net.au/topics/industry-a-resources/item/1866-sulphur-impregnated-activated-carbons-scrub-mercury-in-alumina-refining/1866-sulphur-impregnated-activated-carbons-scrub-mercury-in-alumina-refining

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