

ORIGINAL

ABSTRACT

REDUCING ALUMINOSILICATE SCALE IN THE BAYER PROCESS

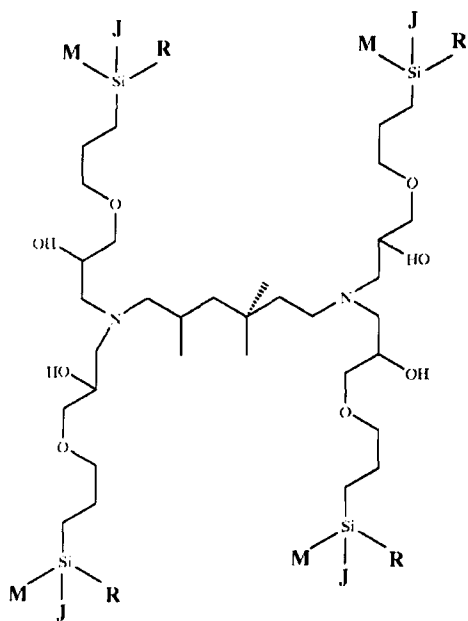
The invention provides a method of inhibiting the accumulation of DSP scale in the liquor circuit of Bayer process equipment. The method includes adding one or more particular silane based small molecules to the liquor fluid circuit. These scale inhibitors reduce DSP scale formation and thereby increase fluid throughput, increase the amount of time Bayer process equipment can be operational and reduce the need for expensive and dangerous acid washes of Bayer process equipment. As a result, the invention provides a significant reduction in the total cost of operating a Bayer process.

I/We Claim:

1. A method for the reduction of aluminosilicate containing scale in a Bayer process comprising the steps of:

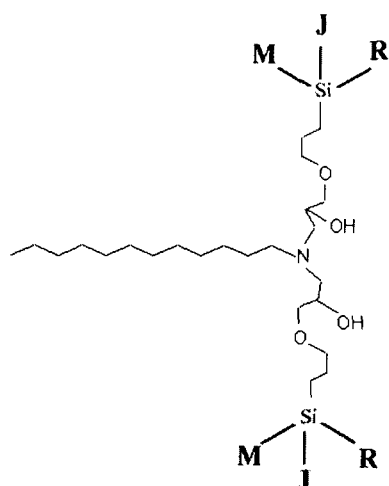
adding to the Bayer process stream an aluminosilicate scale inhibiting amount of a small molecule having at least one $\text{Si}(\text{OR})_n$ group where $\text{R} = \text{H}, \text{C}_1\text{-C}_{12}$ Alkyl, Aryl, Na, K, Li, or NH_4 and $n = 1, 2$, or 3 .

2. The method of claim 1 wherein the small molecule is according to the formula:



wherein M, J, and R groups are each one selected from the list consisting of $\text{C}_1\text{-C}_6$ alkyloxy, hydrogen, hydroxide, or $\text{C}_1\text{-C}_6$ alkyl groups.

3. The method of claim 1 wherein the small molecule is according to the formula:



wherein M, J, and R groups are each one selected from the list consisting of C₁-C₆ alkyloxy, hydrogen, hydroxide, or C₁-C₆ alkyl groups.

4. A method for reducing siliceous scale in a Bayer process comprising the step of:

adding to a Bayer liquor efficacious amount of reaction product between an amine-containing small molecule and an amine-reactive molecule containing at least one amine-reactive group per molecule and at least one - Si(OR)_n group per molecule , where n = 1, 2, or 3, and R = H, C₁-C₁₂ Alkyl, Aryl, Na, K, Li, or NH₄, or a mixture of such reaction products.

5. The method of claim 4 in which the amine containing molecule is selected from the group consisting of: isophoronediamine, C,C,C-trimethylhexanediamine, hexanediamine, meta-xylenediamine, 4,4'-methylenebiscyclohexylamine, 1,2-diaminocyclohexane, saturated fatty amines, unsaturated fatty amines, N-fatty-1,3-propanediamine such as cocoalkylpropanediamine, oleylpropanediamine,

dodecylpropanediamine, hydrogenized tallowalkylpropanediamine, and tallowalkylpropanediamine and any combination thereof.

6. The method of claim 4 wherein the amine-reactive molecule, is selected from a list comprised of 3-glycidoxypropyltrialkoxysilane, 3-glycidoxypropylalkyldialkoxysilane, 3-glycidoxypropyldialkylmonoalkoxysilane, 3-isocyanatopropyltrialkoxysilane, 3-isocyanatopropylalkyldialkoxysilane, 3-isocyanatopropyldialkylmonoalkoxysilane, 3-chloropropyltrialkoxysilane, 3-chloropropylalkyldialkoxysilane, and 3-chloropropyldialkylmonoalkoxysilane.

7. A method for reducing siliceous scale in a Bayer process comprising the step of adding to a Bayer liquor a scale inhibiting amount of a composition of matter, the composition comprising a reaction product made from reacting:

an amine-containing small molecule and,
an amine-reactive small molecule containing at least one amine-reactive group per molecule and at least one - Si(OR)_n group per molecule, where n = 1, 2, or 3, and R = H, C1-C12 Alkyl, Aryl, Na, K, Li, or NH₄, and
an amine-reactive hydrophobic molecule with a molecular weight of less than 500 daltons.

8. The method of claim 7 in which the amine containing molecule is selected from the group consisting of: isophoronediamine, C,C,C-trimethylhexanediamine, hexanediamine, meta-xylenediamine, 4,4'-methylenebiscyclohexylamine, 1,2-diaminocyclohexane, saturated fatty amines, unsaturated fatty amines, N-fatty-1,3-

propanediamine such as cocoalkylpropanediamine, oleylpropanediamine, dodecylpropanediamine, hydrogenized tallowalkylpropanediamine, and tallowalkylpropanediamine and any combination thereof.

9. The method of claim 7 wherein the amine-reactive molecule, is selected from a list comprised of 3-glycidoxypropyltrialkoxysilane, 3-glycidoxypropylalkyldialkoxysilane, 3-glycidoxypropyldialkylmonoalkoxysilane, 3-isocyanatopropyltrialkoxysilane, 3-isocyanatopropylalkyldialkoxysilane, 3-isocyanatopropyldialkylmonoalkoxysilane, 3-chloropropyltrialkoxysilane, 3-chloropropylalkyldialkoxysilane, and 3-chloropropyldialkylmonoalkoxysilane.

10. The method of claim 7 in which the amine-reactive hydrophobic small molecule is selected from a group consisting of C₃-C₂₂ glycidyl ether, C₃-C₂₂ isocyanate, C₃-C₂₂ chloride, C₃-C₂₂ bromide, C₃-C₂₂ iodide, C₃-C₂₂ sulfate ester, C₃-C₂₂ phenolglycidyl ether, and any combination thereof.

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To,
The Controller of Patents
The Patent Office at New Delhi


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