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(12) **EX PARTE REEXAMINATION CERTIFICATE** (11348th)  
**United States Patent**  
Scalzi et al.

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- (54) **METHOD FOR ACCELERATED DECHLORINATION OF MATTER**
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- (52) **U.S. Cl.**  
CPC ..... **B09C 1/10** (2013.01); **B09C 1/08** (2013.01); **B09C 2101/00** (2013.01)
- (58) **Field of Classification Search**  
None  
See application file for complete search history.

(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/013,999, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

*Primary Examiner* — Elizabeth McKane

**Reexamination Request:**  
No. 90/013,999, Aug. 18, 2017

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Patent No.: **7,531,709**  
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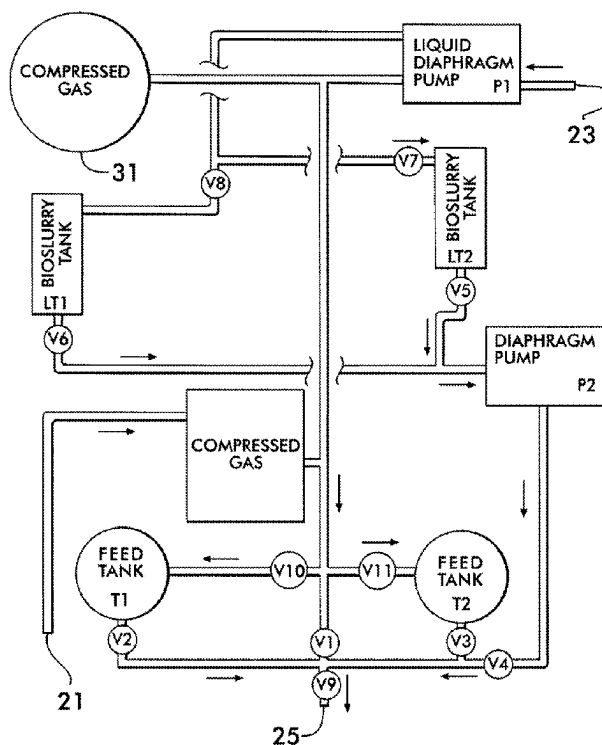
(\*) Notice: This patent is subject to a terminal disclaimer.

**Related U.S. Application Data**

- (63) Continuation of application No. 10/610,558, filed on Jul. 2, 2003, now Pat. No. 7,129,388.
- (60) Provisional application No. 60/437,983, filed on Jan. 6, 2003.
- (51) **Int. Cl.**  
**A62D 3/00** (2006.01)  
**B09C 1/10** (2006.01)  
**B09C 1/08** (2006.01)

(57) **ABSTRACT**

Accelerated dechlorination of soil and water contaminated with chlorinated solvents is achieved by stimulating anaerobic microorganisms and thus increasing the rate of biological mineralization of the solvents. This is accomplished by a treatment process consisting of colloidal suspension of metal powder, an organic hydrogen donor, chemical oxygen scavengers in solution with essential nutrients, and vitamin stimulants such as B2 and B12 delivered via compressed gases N or CO2 so as not to oxygenate an environment targeted for anaerobic processes. The treatment stimulates naturally occurring microorganisms while oxidizing dissolved phase target compounds via the surface action of the iron particles resulting in the breakdown of chlorinated solvents such as tetrachloroethene, trichloroethene, carbon tetrachloride and their daughter products.



EX PARTE  
REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS  
INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

ONLY THOSE PARAGRAPHS OF THE  
SPECIFICATION AFFECTED BY AMENDMENT  
ARE PRINTED HEREIN.

Column 5, line 60-column 6, line 5:

At the end of the four month process, microbial processes are strongly active as demonstrated by the disappearance of tetrachloroethane, [1,1-TCA] 1,1-DCA, and dichloromethane. The alkaline conditions over the four months would suggest that the chloride production observed is primarily due to the microbial dechlorination process. The 4,600 ppb increase in chlorides observed over the period suggest significant microbial activity. There appears to be no toxicity issues in any of the areas on site and there has not been any microbial accumulation of intermediates of the degradation pathways. As a by-product of the program, benzene has also been addressed in those areas where it has been found in the groundwater samples.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims 1-4 are determined to be patentable as amended. Claims 5-12, 14-16, dependent on an amended claim, are determined to be patentable. New claims 17 and 18 are added and determined to be patentable.

Claim 13 was not reexamined.

1. A method for accelerated anaerobic dechlorination of subsoil [matter], comprising the steps of:

supplying a mixture including a zero valent metal into [soil] permeable pathways in the subsoil that chlorinated solvents have migrated to in order to [biologically react with the] reduce concentrations of dissolved chlorinated solvents in [the] groundwater via chemical reactions with a surface of the zero valent metal providing a hydrogen source via hydrolysis of the groundwater at the surface of the zero valent metal and evolution of hydroxides; and

supplying an organic hydrogen donor into the [soil] permeable pathways to provide a hydrogen source via the fermentation of the organic hydrogen donor and produce dechlorinating conditions such that indigenous anaerobic bacteria biodegrade residual concentrations of chlorinated solvents, wherein combined use of the zero valent metal and the organic hydrogen donor together in the permeable pathways accelerate dechlorination of contaminants in the subsoil and dechlorinate intermediates of the chlorinated solvents.

2. The method of claim 1 further including the step of supplying a reducing agent into said [soil] permeable pathways to remove oxygen from groundwater and soil moisture.

3. The method of claim 1 wherein the steps of supplying said mixture and said organic hydrogen donor are carried out by placing an injection rod into the [soil] subsoil and then injecting them under pressure through [an] the injection rod into the permeable pathways.

4. The method of claim 3 further including the preliminary step of injecting a gas under pressure through said injection rod and into the permeable pathways in said [soil] subsoil to establish preferential delivery pathways [therein].

17. The method of claim 1, wherein the intermediates include cis-1,2-DCE.

18. The method of claim 1, wherein the intermediates include vinyl chloride (VC).

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