

**(12) STANDARD PATENT**  
**(19) AUSTRALIAN PATENT OFFICE**

(11) Application No. **AU 2007319031 B2**

(54) Title  
**Novel kimberlite based fertilizer products**

(51) International Patent Classification(s)  
**C05D 9/00 (2006.01)**

(21) Application No: **2007319031**

(22) Date of Filing: **2007.11.05**

(87) WIPO No: **WO08/056222**

(30) Priority Data

(31) Number  
**2039/CHE/2006**

(32) Date  
**2006.11.06**

(33) Country  
**IN**

(43) Publication Date: **2008.05.15**

(44) Accepted Journal Date: **2013.07.25**

(71) Applicant(s)  
**Bijam Biosciences Private Limited**

(72) Inventor(s)  
**Prasad, Durga Yandapalli**

(74) Agent / Attorney  
**Davies Collison Cave, Level 14 255 Elizabeth Street, Sydney, NSW, 2000**

(56) Related Art  
**Jain, R.C. et al. "Response and economic viability of wheat (Triticum aestivum) to kimberlite along with chemical fertilizers and phosphate-solubilizing bacteria" Crop Research (1997) Vol.14 No.3 pages 427 to 431  
WO 2005/097947 A1**

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
15 May 2008 (15.05.2008)

PCT

(10) International Publication Number  
**WO 2008/056222 A3**

(51) International Patent Classification:  
**C05D 9/00** (2006.01)

IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(21) International Application Number:

PCT/IB2007/003342

(22) International Filing Date:

5 November 2007 (05.11.2007)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2039/CHE/2006 6 November 2006 (06.11.2006) IN

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant and

(72) Inventor: **PRASAD, DURGA, YANDAPALLI** [IN/IN];  
C/o Rudraram Research Institute of Agricultural Sciences,  
Rudraram, Medak District, Andra Pradesh 502 329 (IN).

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

(74) Agents: **GABRIEL, Devadoss, Calab** et al.; K & S Partners, 84-C, C-6 Lane, off Central Avenue, Sainik Farms, New Delhi 110 062 (IN).

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL,

(88) Date of publication of the international search report:

4 December 2008



**WO 2008/056222 A3**

(54) Title: NOVEL KIMBERLITE BASED FERTILIZER PRODUCTS

(57) Abstract: Kimberlite based fertilizer products are produced by treating micronized Kimberlite with alkali or first acid then alkali or by mixing the micronized kimerlite with DAP or NPK fertilizer.

## NOVEL KIMBERLITE BASED FERTILIZER PRODUCTS

### FIELD OF THE INVENTION

5

In general, this invention relates to the field of material sciences. In particular, this invention pertains to production of fertilizers from Kimberlite. This invention also relates to a method of manufacturing fertilizer products from Kimberlite having applications in the field of agriculture.

10

### BACK GROUND OF THE INVENTION

15

Diamonds are formed when carbon deposits are exposed to high pressure and temperature for prolonged periods. Deep within the earth, there are regions that are at a high enough temperature and pressure that the formation of diamonds is thermo dynamically possible. Under the continental crust, diamonds form starting at depths of about 90 miles where pressure is roughly 5 giga pascals and the temperature is around 2200° Fahrenheit. Diamonds are mined in 'kimberlite pipe'. Kimberlite is an ultra potassic, ultra mafic, igneous rock composed of garnet, olivine, phlogopite, and pyroxene with a variety of other trace minerals. Kimberlite occurs in the earth's crust in vertical structures known as Kimberlite pipes. India is host to the largest known number of proterozoic Kimberlite clan rocks.

20

Large amounts of Kimberlite is required to produce a carat of diamond. Few tonnes are required to yield a carat of diamond. Large amount of Kimberlite after removal of diamond is available around the globe without any appropriate utility. Kimberlite contains magnesium, trace metals and silica in rich proportions. Therefore, present invention objective is to invent method of producing Kimberlite based fertilizers.

25

### OBJECTS OF THE INVENTION

30

Accordingly, the primary object of this invention is to invent fertilizers products from Kimberlite which can be used as fertilizer.

Another object of this invention is to develop production method of Kimberlite based fertilizer products. Yet another objective of this invention is to invent Kimberlite based products with organic nature. Still another objective of this invention is to provide a method for production of organic based Kimberlite products.

### **SUMMARY OF THE INVENTION**

The present invention provides novel fertilizer products from Kimberlite having utility as nutrients to supply silica, magnesium, trace elements with or without organic substances, and also having scope to design products with various combinations with other fertilizers and / or plant based nutrients.

According to a first aspect of the invention there is provided a plant nutrient composition comprising:

a first component comprising alkali treated kimberlite; and

a second component comprising lignite;

wherein the ratio between the first and the second component is in the range of 10:1 to 1:10 on a weight by weight basis.

According to a second aspect of the invention there is provided a process for preparing the plant nutrient composition according to the first aspect, said process comprising the steps:

- a. subjecting kimberlite to a micronization process to obtain micronized kimberlite;
- b. adding an alkali to the micronized kimberlite to obtain a mixture;
- c. mixing thoroughly the mixture thus obtained in step (b) and adjusting moisture content and temperature of the same to obtain a reaction mixture;
- d. adding lignite to the reaction mixture thus obtained in step (c), a quantity of lignite being such that the ratio between the reaction mixture and lignite is in the range of 10:1 to 1:10 on a weight by weight basis; and
- e. subjecting a product thus obtained in step (d) to a pelletizing or a powdering procedure to obtain the plant nutrient composition.

## 2A

According to a third aspect of the invention there is provided a plant nutrient composition comprising:

a first component comprising kimberlite treated with nitric acid and alkali; and

a second component comprising lignite;

5 wherein the ratio between the first and the second component is in the range of 10:1 to 1:10 on a weight by weight basis

According to a fourth aspect of the invention there is provided a process for preparing the plant nutrient composition according to the third aspect, said process comprising the steps:

- 10 a. subjecting kimberlite to a micronization process to obtain micronized kimberlite;
- b. adding nitric acid to the micronized kimberlite and thereafter an alkali to obtain a mixture;
- c. mixing thoroughly the mixture thus obtained in step (b) and adjusting moisture content and temperature of the same to obtain a reaction mixture;
- 15 d. adding lignite to the reaction mixture thus obtained in step (c), a quantity of lignite being such that the-ratio between the reaction mixture and lignite is in the range of 10:1 to 1:10 on a weight by weight basis; and
- e. subjecting a product thus obtained in step (d) to a pelletizing or a powdering procedure to obtain the plant nutrient composition.

20

According to a fifth aspect of the invention there is provided a plant nutrient composition comprising:

a first component comprising kimberlite treated with phosphoric acid and alkali;  
and

25 a second component comprising lignite;

wherein the ratio between the first and the second component is in the range of 10:1 to 1:10 on a weight by weight basis.

According to a sixth aspect of the invention there is provided a process for preparing the plant nutrient composition according to the fifth aspect. said process comprising the steps:

30

- a. subjecting kimberlite to a micronization process to obtain micronized kimberlite;
- b. adding phosphoric acid to the micronized kimberlite and thereafter an alkali to obtain a mixture;

2007319031 21 Jun 2013

## 2B

- c. mixing thoroughly the mixture thus obtained in step (b) and adjusting moisture content and temperature of the same to obtain a reaction mixture:
- d. adding lignite to the reaction mixture thus obtained in step (c), a quantity of lignite being such that the ratio between the reaction mixture and lignite is in the range of 10:1 to 1:10 on a weight by weight basis; and
- e. subjecting a product thus obtained in step (d) to a pelletizing or a powdering procedure to obtain the plant nutrient composition.

## DETAILED DESCRIPTION OF THE INVENTION

Now this invention will be described in detail so as to illustrate and explain various salient features of the invention. One embodiment of the invention is to provide Kimberlite based fertilizer products by reacting and / or blending with alkali. Another embodiment of the present invention relates to a method of production of organic based Kimberlite products by blending with lignite along with alkali.

In a preferred embodiment, the present invention provides method of producing Kimberlite based fertilizer products and the said method comprising the following steps:

- (a) Micronization of Kimberlite
- (b) Addition of Alkali (Sodium Hydroxide or Potassium Hydroxide or Ammonia etc.) to Kimberlite
- (or)
- Addition of Nitric Acid or Phosphoric Acid and later neutralizing with alkali (Sodium

Hydroxide or Potassium Hydroxide or Ammonia etc.)

(or)

Addition of Kimberlite as filler material with other fertilizers such as DAP and other single -direct and / or complex fertilizers of NPK.

5 (c) Mixing thoroughly the reactants

(d) Adjusting the moisture content and temperature for optimum reaction

(or)

Addition of lignite and adjusting the moisture content and temperature for optimum reaction

10 (e) Pelletizing or powdering by removal of moisture

### **BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS**

Figure (1) relates to the various steps involved in the manufacturing process of various fertilizer products from Kimberlite.

15 Figure (2) relates to the comparative FTIR analysis of Kimberlite, Kimberlite treated with alkali, Kimberlite treated with Nitric Acid, Phosphoric Acid and Ammonia, Kimberlite treated with Nitric Acid and Ammonia.

Now the invention will be described in the following description. The nature of the invention and the manner in which the invention is to be carried out will be described in  
20 detail.

Figure (1) relates to the various steps involved in the manufacturing process of various types of fertilizer products from Kimberlite.

Figure (2) relates to the comparative FTIR analysis of Kimberlite, Kimberlite treated with alkali, Kimberlite treated with Nitric Acid, Phosphoric Acid and Ammonia,  
25 Kimberlite treated with Nitric Acid and Ammonia. The characteristic absorbance of the peaks with variability was observed for the treatments in relation to non-treated Kimberlite.

Now the applicant provides following specific description by way of examples and illustrations of the invention and this should not be construed to limit the scope of the invention in any manner.

Alkali (Sodium Hydroxide or Potassium Hydroxide or Ammonia etc.) to Kimberlite was  
5 added at a ratio of 1:3 to 1:50 (w/w). The mixture of alkali and kimberlite was blended by grinding properly, then water was added appropriately to mix thoroughly. The resultant material was pelleted for usage as the fertilizer.

Nitric Acid or Phosphoric Acid was added to Kimberlite (5 to 50 % v/w) and later  
10 neutralizing with alkali (Sodium Hydroxide or Potassium Hydroxide or Ammonia etc.) was done.

Kimberlite was added as filler material with other fertilizers such as DAP and other single -direct and / or complex fertilizers of NPK.

Lignite was added to Kimberlite at a ratio of 10: 1 to 1: 10 and later alkali was added to the mixture of lignite and kimberlite at a ratio of 1:3 to 1:50 (w/w). The mixture of alkali  
15 and lignite-kimberlite was blended by grinding properly, then water was added appropriately to mix thoroughly.

When kimberlite based fertilizer products were tested on various agricultural crops enhanced yields significantly. When silica supplementation has been done through these  
20 kimberlite based products, on crops, it imparted resistance to diseases apart from yield enhancement.

Present invention explains production of various types of Kimberlite based fertilizer products for enhancement of yield of various agricultural crops.

The results derived from the present invention gives a scope of using Kimberlite based  
25 fertilizer products for effective and economic integrated fertilizer management.

This invention has been explained by way of few examples and is not restricted to various combinations and feasibilities of the basic aspect.



4A

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

5

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

10

2007319031 21 Jun 2013

**The claims defining the invention are as follows:**

1. A plant nutrient composition comprising:  
a first component comprising alkali treated kimberlite; and  
5 a second component comprising lignite;  
wherein the ratio between the first and the second component is in the range of  
10:1 to 1:10 on a weight by weight basis.
2. The plant nutrient composition according to claim 1, wherein the kimberlite is  
10 micronized kimberlite.
3. The plant nutrient composition according to claim 2, wherein said alkali treated  
micronized kimberlite is obtained by reacting an alkali selected from sodium  
hydroxide, potassium hydroxide or ammonia with kimberlite in a ratio of 1:3 to  
15 1:50 on a weight by weight basis.
4. The plant nutrient composition according to claim 3, wherein the micronized  
kimberlite is treated with 5 to 50% volume by weight of nitric acid prior to reacting  
the same with the alkali.  
20
5. The plant nutrient composition according to claim 3, wherein the micronized  
kimberlite is treated with 5 to 50% volume by weight of phosphoric acid prior to  
reacting the same with the alkali.
- 25 6. A process for preparing the plant nutrient composition as claimed in any one of  
claims 1 to 5, said process comprising the steps:
  - a. subjecting kimberlite to a micronization process to obtain micronized  
kimberlite;
  - b. adding an alkali to the micronized kimberlite to obtain a mixture;
  - 30 c. mixing thoroughly the mixture thus obtained in step (b) and adjusting  
moisture content and temperature of the same to obtain a reaction mixture;
  - d. adding lignite to the reaction mixture thus obtained in step (c), a quantity of  
lignite being such that the ratio between the reaction mixture and lignite is

in the range of 10:1 to 1:10 on a weight by weight basis; and

- e. subjecting a product thus obtained in step (d) to a pelletizing or a powdering procedure to obtain the plant nutrient composition.

5 7. The process according to claim 6, wherein in step (b), the alkali is selected from sodium hydroxide, potassium hydroxide or ammonia and is added to the micronized kimberlite in a ratio of 1:3 to 1:50 on a weight by weight basis.

10 8. The process according to claim 7, wherein prior to the addition of alkali to the micronized kimberlite the process comprises adding 5 to 50% volume by weight of nitric acid to the micronized kimberlite.

15 9. The process according to claim 7, wherein prior to the addition of alkali to the micronized kimberlite the process comprises adding 5 to 50% volume by weight of phosphoric acid to the micronized kimberlite.

20 10. A plant nutrient composition comprising:  
a first component comprising kimberlite treated with nitric acid and alkali; and  
a second component comprising lignite;  
wherein the ratio between the first and the second component is in the range of 10:1 to 1:10 on a weight by weight basis.

25 11. A process for preparing the plant nutrient composition as claimed in claim 10, said process comprising the steps:  
a. subjecting kimberlite to a micronization process to obtain micronized kimberlite;  
b. adding nitric acid to the micronized kimberlite and thereafter an alkali to obtain a mixture;  
c. mixing thoroughly the mixture thus obtained in step (b) and adjusting  
30 moisture content and temperature of the same to obtain a reaction mixture;  
d. adding lignite to the reaction mixture thus obtained in step (c), a quantity of lignite being such that the ratio between the reaction mixture and lignite is in the range of 10:1 to 1:10 on a weight by weight basis; and

e. subjecting a product thus obtained in step (d) to a pelletizing or a powdering procedure to obtain the plant nutrient composition.

12. The process according to claim 11, wherein the alkali is selected from the group consisting of sodium hydroxide and potassium hydroxide.

13. A plant nutrient composition comprising:  
a first component comprising kimberlite treated with phosphoric acid and alkali;  
and  
a second component comprising lignite;  
wherein the ratio between the first and the second component is in the range of 10:1 to 1:10 on a weight by weight basis.

14. A process for preparing the plant nutrient composition as claimed in claim 13, said process comprising the steps:

- a. subjecting kimberlite to a micronization process to obtain micronized kimberlite;
- b. adding phosphoric acid to the micronized kimberlite and thereafter an alkali to obtain a mixture;
- c. mixing thoroughly the mixture thus obtained in step (b) and adjusting moisture content and temperature of the same to obtain a reaction mixture;
- d. adding lignite to the reaction mixture thus obtained in step (c), a quantity of lignite being such that the ratio between the reaction mixture and lignite is in the range of 10:1 to 1:10 on a weight by weight basis; and
- e. subjecting a product thus obtained in step (d) to a pelletizing or a powdering procedure to obtain the plant nutrient composition.

15. The process according to claim 13, wherein the alkali is selected from the group consisting of sodium hydroxide and potassium hydroxide.

16. A process for preparing a plant nutrient composition as claimed in claim 6, 11 or 14, substantially as herein described with reference to the drawings.

2007319031 21 Jun 2013

**FIGURE-1**

