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(71) Applicant (for all designated States except US): TSL ENGENHARIA, MANUTENÇÃO E PRESERVAÇÃO AMBIENTAL LTDA. [BR/BR]; R. Funchal 411, 7th Floor, Vila Olimpia, 04551-060 São Paulo - SP (BR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): SZENTE, Roberto Nunes [BR/BR]; R. Acangueruçu 124, 05579-020 São Paulo - SP (BR). SZENTE, Milton Oscar [BR/BR]; R. Engenheiro Teixeira Soares, 343, 05505-030 São Paulo - SP (BR).

(74) Agent: ADVOCACIA PIETRO ARIBONI S/C; Rua Guararapes, 1909 - 7º Andar, Brooklin Novo, 04561-004 São Paulo - SP (BR).

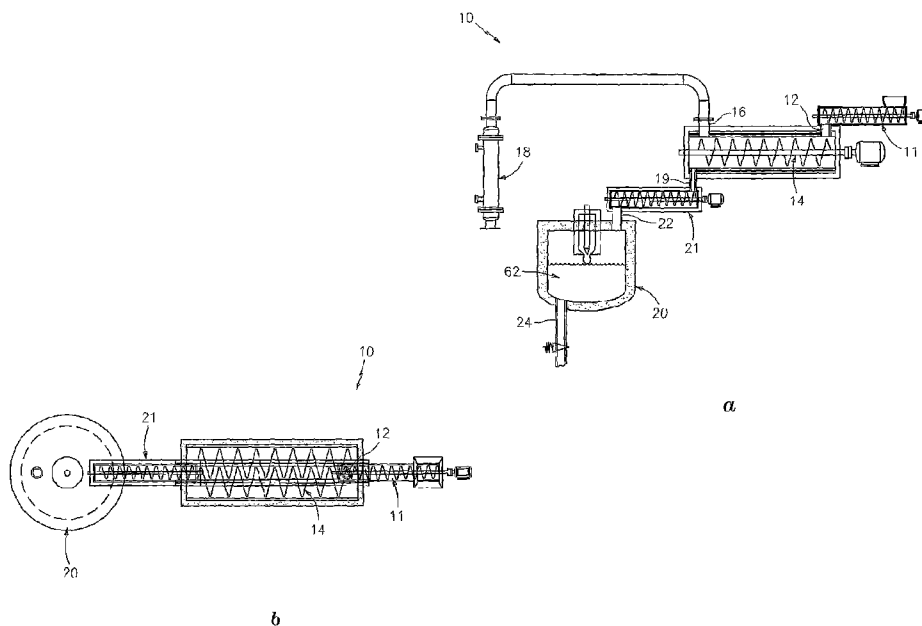
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2 April 2009

(54) Title: PROCESS AND APPARATUS FOR USE IN RECYCLING COMPOSITE MATERIALS



(57) Abstract: A process for recycling composite materials includes the steps of feeding a quantity of composite material composed of at least one polymer and aluminum into at least one first reactor; heating the composite material in a non-oxidizing environment at a temperature sufficient to volatilize the at least one polymer and form a hydrocarbon by-product and aluminum in the at least one first reactor; feeding the aluminum free of the at least one polymer into a second reactor; and heating the aluminum in a non-oxidizing environment at a temperature sufficient to melt the aluminum in the second reactor.

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/BR07/00009

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC: **C22B 7/00( 2006.01),21/06( 2006.01)**

USPC: **75/686,687**  
 According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 U.S. : 75/686,687

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 Please See Continuation Sheet

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|------------|--|-----------------------|
| Y          | US 5,405,428 A (DUBE et al) 11 April 1995 (11.04.1995), column 2, line 63 to column 3, line 11; column 5, line 15; column 6, lines 63-65, column 7, line 4 and 69. | 1-3, 9, 19, 20        |
| Y          | US 5,801,907 A (OKADA et al) 22 September 1998 (22.09.1998), column 4, lines 61-63, column 5, line 41, column 15, lines 5 and 6.                                   | 9, 19, 20             |
| A          | US 2003/0129077 A1 (KOCH et al) 10 July 2003 (10.07.2003), entire patent   | 1-21                  |
| A          | JP 01287231 A (OGA et al) 17 November 1989 (17.11.1989), English abstract.   | 1-21                  |
| A          | US 5,447,548 A (LINDSEY) 5 September 1995 (05.09.1995), entire patent.   | 15-18                 |

Further documents are listed in the continuation of Box C.

See patent family annex.


| * Special categories of cited documents:  |     |  |
|---|-----|--|
| "A" document defining the general state of the art which is not considered to be of particular relevance  | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  |
| "E" earlier application or patent published on or after the international filing date   | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone   |
| "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "O" document referring to an oral disclosure, use, exhibition or other means  | "&" | document member of the same patent family  |
| "P" document published prior to the international filing date but later than the priority date claimed  |     |  |

Date of the actual completion of the international search  
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Name and mailing address of the ISA/US  
 Mail Stop PCT, Attn: ISA/US  
 Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, Virginia 22313-1450  
 Facsimile No. (571) 273-3201

Authorized officer  
 Roy King  
 Telephone No. 5712722744



# INTERNATIONAL SEARCH REPORT

International application No.

PCT/BR07/00009

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
Please See Continuation Sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
  3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
  4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-21
- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
  - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
  - No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/BR07/00009

## BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-21, drawn to a process.

Group II, claim(s) 22-63, drawn to an apparatus.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the use of a first and second reactor is the common technical feature between Groups I and II. However, this special technical feature is known in the art as evidenced by US 2003/0129077 A1.

Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: aluminum, plasma, polymer, hydrocarbon