Amended cl

CLAIMS E-01/29059/2015



I Claim:

1. The catalyst composition comprising of rare earth metal in the form of trifluromethane sulfonate anchored with hexagonal organic - inorganic functionalized mesoporous silica having surface area in the range of 50-1000 m^2/g; pore volume in the range of 0.1-1.5 ml/g and pore diameter in the range 20-100 A and silicon (Si) 10-90 wt%, rare earth metal 0.1-50 wt %, carbon 1-10 wt %, sulfur 2-30wt%, fluorine 0.1-30 wt%.

2. The catalyst composition according to claim 1, wherein the rare earth metal is selected from the group comprising Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb.

3. The catalyst composition according to claim 1, wherein, the rare earth metal is preferably La, Ce, Sc, Y.

4. The catalyst composition according to claim 1, wherein, rare earth metals are in the form of chloride, sulphate, hydroxide, nitrate, carbonate and acetate salt of metal ions.

5. The catalyst composition according to claim 1, wherein hexagonal organic -inorganic functionalized mesoporous silica acts as support metal.

6. The catalyst according to claims 1 and 5, the ratio of silicate precursor with organofunctionalised silica is in the range of 1:50 and 50:1.

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7. The catalyst according to claims 5, wherein functionalized silica is linked by linking molecule containing a functional group comprising of either halide, hydroxyl, carbonyl, anhydride, epoxide, nitrile, rnercapto and amine.

8. The catalyst according to claims 5, wherein the functional group precursor used is 3-(mercaptopropyl) trimethoxysilane.

9. The catalyst according to claims 1 and 5, wherein the catalyst is separated from reaction mass by filtration and reused in subsequent reaction without loss in the catalyst activity.

10. The catalyst claimed in claim 1 is easily separable and reusable.

11. Process for production of catalyst composition described in claim 1 comprising the steps of :

    a) The hexagonal organic - inorganic functionalized mesoporous silica is prepared either by co-precipitation or grafting technique by reacting silicate precursor with organofunctionajised silica in the presence of C6-C18 template.
    b) Organic template removal through solvent extraction by using C1-C4 alcohol and/or by calcination.
    c) Ion exchange of rare earth metal and/or mixture thereof with the hexagonal organic - inorganic functionalized mesoporous silica.
    d) Conversion of rare earth metals to their corresponding triflurornethane sulphonate salt by reacting with triflurornethane sulfonic acid.

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12. The catalyst according to claims 1 to 10, wherein the catalyst shows excellent activity for production of biomass based chemical such as furfural, 5-hydroxymethyl furfural.

13. The catalyst according to claims 1 to 10 and 12, wherein the catalyst is used in an amount of 0.1 to 15 % wt/wt of the reaction mixture.

Dated this 08th day of July 2015.

Poonam Dhake Kolhe

Of In10gible Innovations LLP

Applicant's Agent

granted

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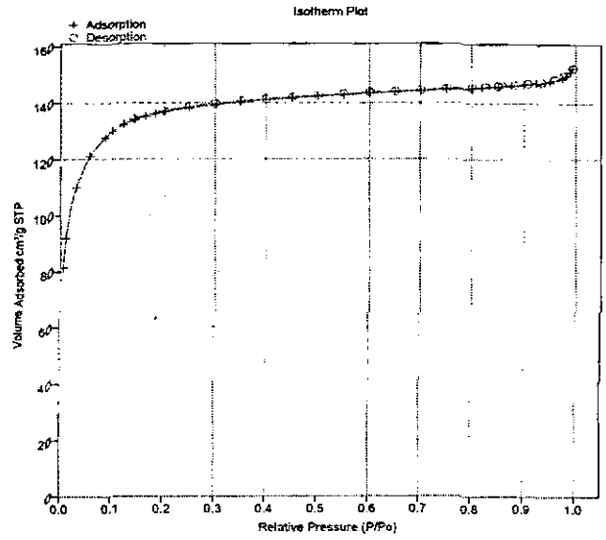
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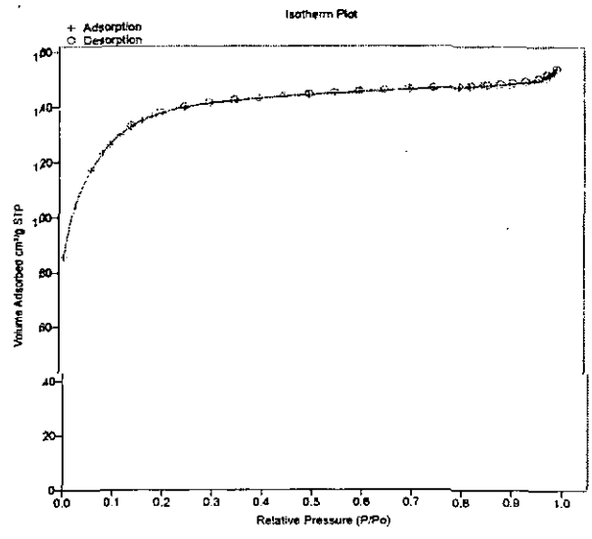
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Drawing No.:1

Applicant's name: **YADAV** **GANAPATI** **DADASAHEB**

(Last Name/Surname) *(First Name)* *(Father's Name/Middle Name)*





Signature of Applicant:

YADAV **GANAPATI** **DADASAHEB**

(Last Name/Surname) *(First Name)* *(Father's Name/Middle Name)*

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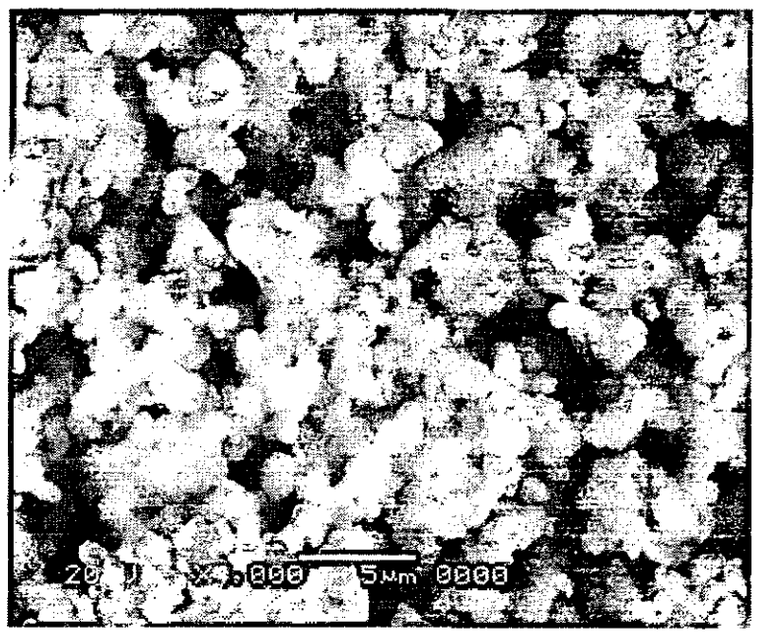
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Drawing No.:2

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(Last Name/Surname) *(First Name)* *(Father's Name/Middle Name)*



Signature of Applicant:

YADAV **GANAPATI** **DADASAHEB**

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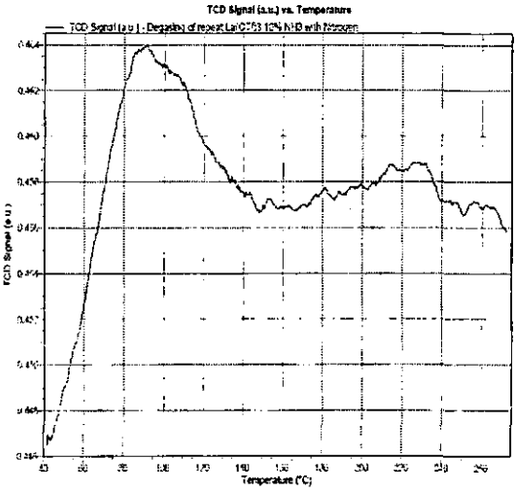
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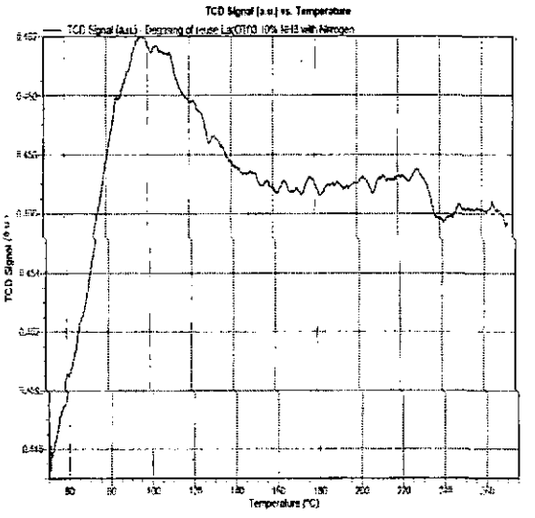
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Applicant's name: **YADAV GANAPATI DADASAHEB**

(Last Name/Surname) (First Name) (Father's Name/Middle Name)



NH_3-TPD profile of ICaT-2



NH_3-TPD of used ICaT-2

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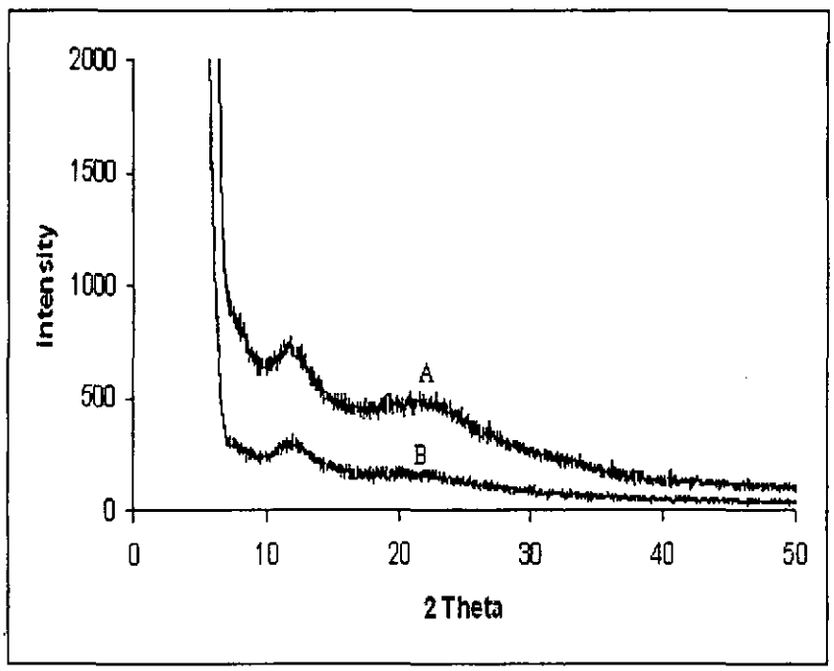
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Applicant's name: **YADAV** **GANAPATI** **DADASAHEB**

(Last Name/Surname) *(First Name)* *(Father's Name/Middle Name)*



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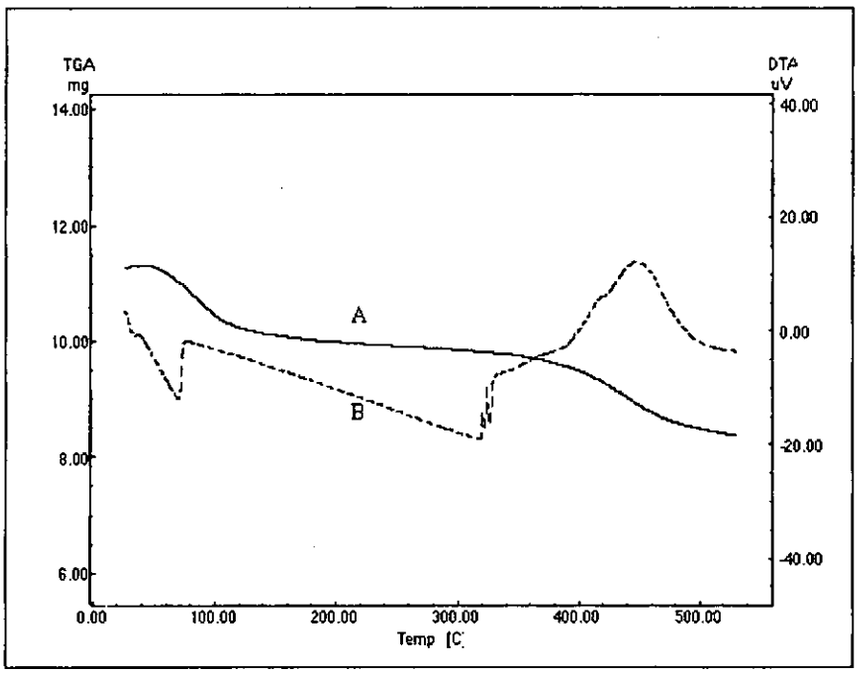
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(Last Name/Surname) *(First Name)* *(Father's Name/Middle Name)*



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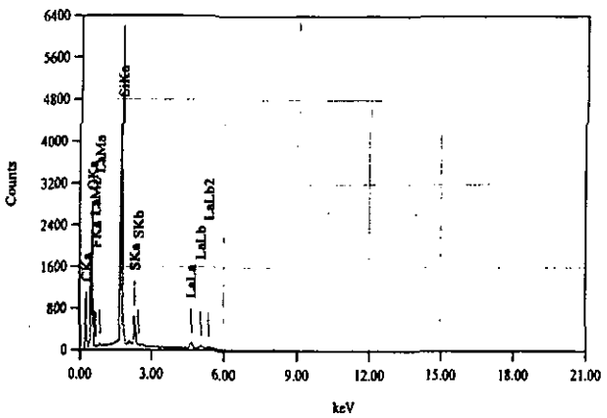
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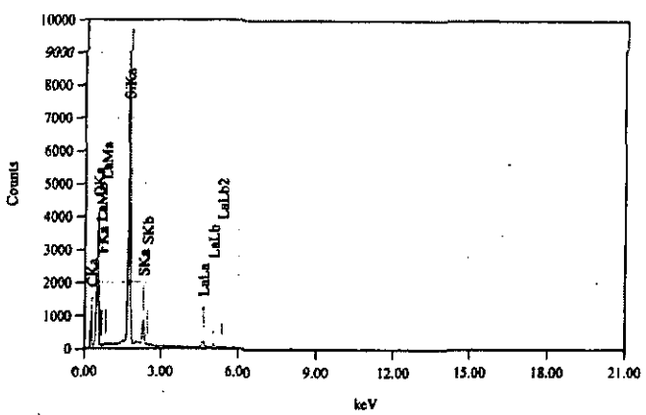
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EDX Spectra of Fresh ICaT-2



EDX spectra of Used ICaT-2

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ABSTRACT

The water tolerant solid heterogeneous acid catalyst (ICaT-2) has been disclosed herein. The catalyst of the invention comprises of rare earth metals in the form of trifluromethansulphonate, anchored with hexagonal organic- inorganic mesoporous silica as base metal through organic-inorganic linkages. The said catalyst composition has the specific surface area in the range of 100 m^2/g to 1000 m^2/g and the pore diameter in the range of 20-100 Å. The ICaT-2 catalyst shows very good activity and reusability for production of furfural and 5-hydroxymethylfurfural from xylose and fructose.



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FORM 2

THE PATENTS ACT, 1970
(39 of 1970)

COMPLETE SPECIFICATION
(See section 10 and rule 13)

1. TITLE OF THE INVENTION

"CATALYST COMPOSITION (ICAT-2) COMPRISING OF RARE EARTH METAL"

2. APPLICANT

NAME : **YADAV GANAPATI DADASAHEB**
(Last Name/Surname) (First Name) (Father's Name/Middle Name)

NATIONALITY: **INDIAN**

ADDRESS : **CHEMICAL ENGINEERING DEPARTMENT,**
INSTITUTE OF CHEMICAL TECHNOLOGY
(DEEMED UNIVERSITY),
NATHALAL PARIKH MARG,
MATUNGA (EAST)
MUMBAI 400 019
INDIA

The following specification particularly describes the invention and the manner in which is to be performed.

ORIGINAL

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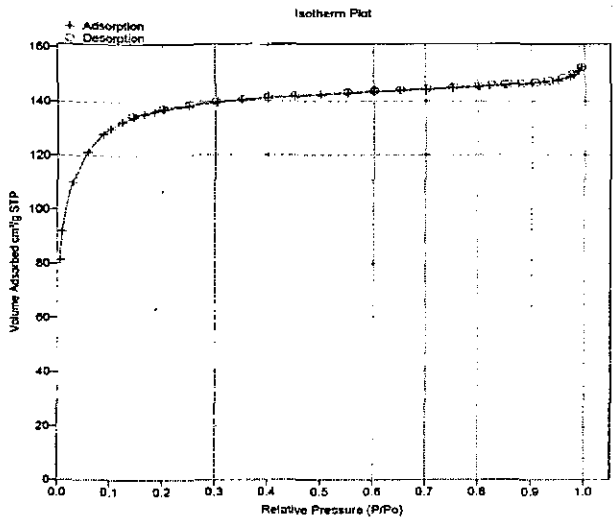
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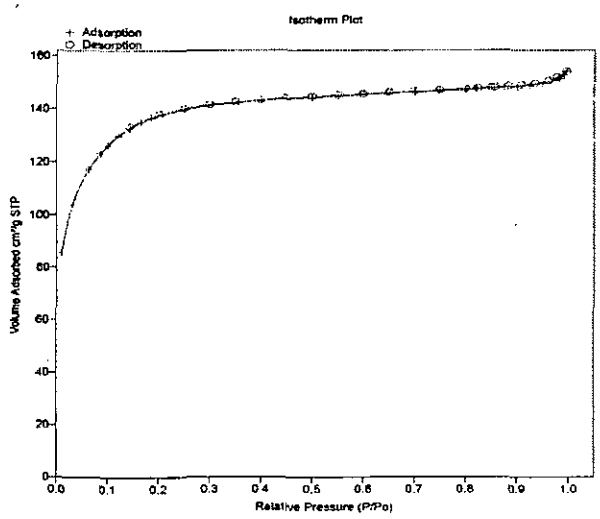
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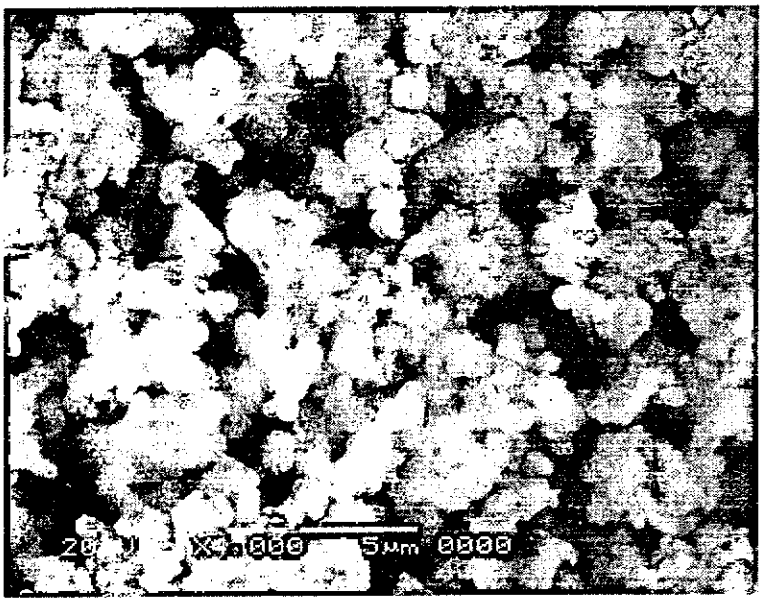
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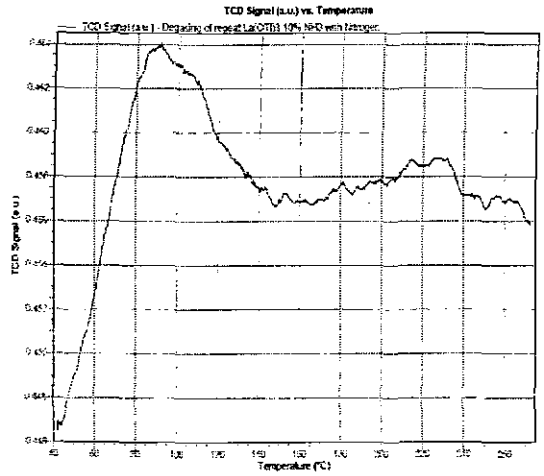
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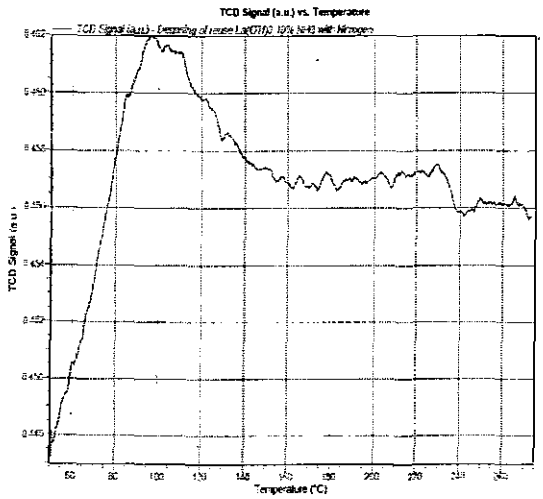
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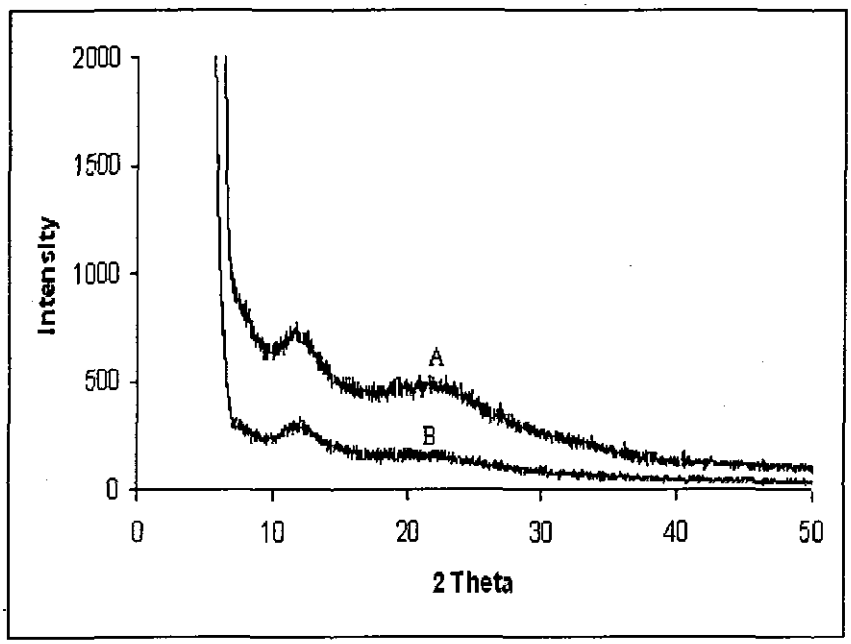
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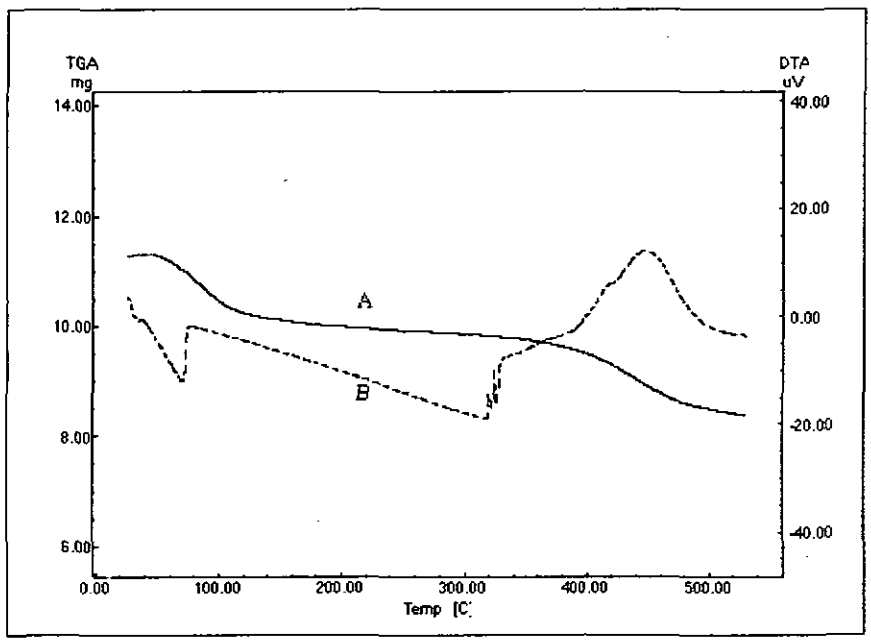
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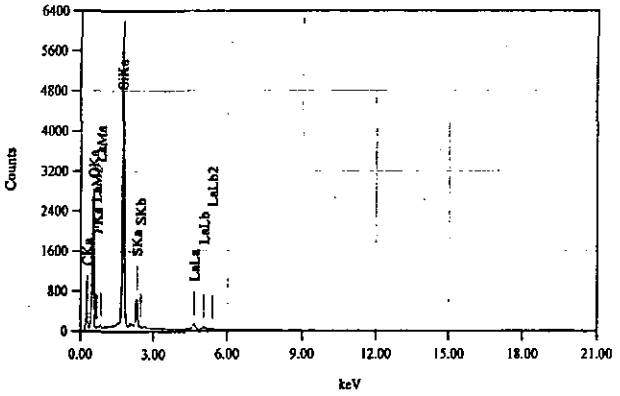
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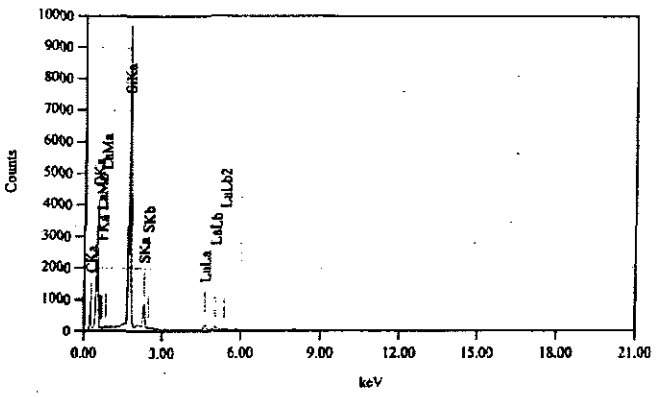
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