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- Algeria

Abstract of Post-Doctoral report

Name: EL-HABIB BELARBI

Country: ALGERIA

Field of Study/research: Environmental preservation

Institution/Country of study: KING FAHD UNIVERSITY OF PETROLEUM

& MINERALS, RESEARCH INSTITUTE, CENTER OF ENVIRONMENT & WATER/

SAUDI ARABIA

Date study began: 09/02/2004

Completion Date: 30/07/2004

Title: Solidification and stabilization of organic and inorganic pollutants by

modified clays.

Field: environmental preservation

Clay minerals are among the most reactive soil components which, due to their large specific surface area and ion exchange capacity, are capable of adsorbing organic and inorganic pollutants. The exact description of the interaction between the pollutants and clay surface is essential for environmental protection. This will open the way for development of new procedures for the immobilization of pollutants in aqueous media and soil. Different studies on selective adsorption showed that modified clay exhibits a high affinity for a specific class of pollutants. In this project we have verified that a local modified clay extracted from local soil called Khoweldi adsorbs organic and inorganic pollutants (phenol and nickel) very effectively. The adsorption is enhanced by altering the surface polarity of the clay by treatment with cationic surfactants. After this treatment, the stabilization of pollutants was necessary to prevent their transport from clay back to the environment due to evaporation, leaching or hydration. This goal was achieved by converting the contaminated medium into a solid block and its stabilization by encapsulating with organosilane (trichlorobutylsilane) that made clay hydrophobic.

-Scientific paper produced and presented SRO 5 :

Modified local clay for phenol sorption, H.Belarbi, B. Haddad, B.Fettouhi, M. H.AI-Malack, Atique Mian SRO 5 Fez (Morocco)

28-30 octobre 2008

Abstract: Phenol is a common pollutant listed by US Environmental Protection Agency among the priority pollutants. The classical treatments of phenol removal are either not cost effective or limited in large-scale application like biological or thermal decomposition treatment. In this paper we present the adsorption of phenol by clay extracted from local soil called Khoweldi and its use as matrix for long term storage of organic pollutants that can be an alternative of previous methods. The stabilised clay then can be safely disposed in landfills. The X-Ray diffraction revealed that studied clay is muscovite. Phenol adsorption isotherms conducted on natural and modified clay with Hecadecyltrimethylammonium (HDTMA) revealed that HDTMA enhanced the adsorption capacity of the clay for phenol. To prevent the leaching out of the adsorbed pollutants, we suggest the use of a known method of encapsulation by organosilane that seems be necessary in the case of modified clay.

BELARBI EL-HABIB

PERSONAL INFORMATION

- Nationality : Algerian
- Marital Status : Married + 03 children

DEGREES

- Ph.D. in Physical Chemistry. (1994-1997), Montpellier II University (France).
- Master of Sc. In solid state physics (Highest honours) (1987-1990), Oran University (Algeria).
- Bachelor's degree in Solid State Physics (1983-1987) Oran University (Algeria).
- High school Diploma, option: Mathematics, (1980-1983) Ahmed Medeghri High school Tiaret (Algeria).

PUBLICATIONS

1. *Dehydration Enthalpy of Alkali Cations Exchanged Montmorillonite from Thermo-Gravimetric Analysis*. M. Kharroubi, S. Balmé, F. Henn, J.C. Giuntini, **H. Belarbi** and A. Haouzi, Journal of Colloid & Interface Science, volume 329, issue2, (2009), 339-345
2. *Hydration of a Na⁺-montmorillonite studied by Thermally Stimulated Depolarization Current* **H. Belarbi**; A. Haouzi; J.M. Douillard; J.C. Giuntini; F. Henn, Journal of Colloid and Interface Science 308 (2007) 216-22
3. *Activation energy for dc conductivity in dehydrated aluminosilicates: experimental results and model*. Haouzi, M. Kharroubi, **H. Belarbi**, S. Devautour-Vinol, F. Henn,*, J.C. Giuntini, Applied Clay Science (2004) p.67-74
4. *Analysis of thermally stimulated depolarization current (TSDC), measured on exchanged clay*; V. Medout-Marere, **H. Belarbi**, A. Haouzi, J.C. Giuntini, J.M. Douillard, J.V. Zanchetta and J. Vanderschueren; J. of Colloid and Interface Science, 223, (2000), p. 61-73
5. *Comparison between Conductivity and Thermally Stimulated Currents measured on dehydrated Ca-Montmorillonite*; A. Haouzi, **H. Belarbi**, J.C. Giuntini, J.V. Zanchetta & J. Vanderschueren; Clay Minerals vol 35 (2000) p323-333.
6. *Thermodynamic analysis of the immersion of swelling clays*. V. Medout-Marere, **H. Belarbi**, P. Thomas, F. Morato, J.C. Giuntini & J.M. Douillard; J. of Colloid and Interface Science,(1998), p.139-148
7. *Interpretation of polarization conductivity in homotonic dry montmorillonite*, **H. Belarbi**, A. Haouzi, J.C. Giuntini, J.V. Zanchetta, J. Niezette & J. Vanderschueren; Clay Minerals, (1997),32, p.13-20
8. *Conduction Band edge charge densities in II-VI compound semiconductor*; H. Aourag, B. Kheifia, L. Hameurlaine, **H. Belarbi** & A. Belaidi; Physics Letters (1990) vol. 145, pp. 455 .

1. *Modified local clay for phenol sorption*, **H.Belabji**, B. Haddad, B.Fetouhi, M. H.Al-Malack, Atique Mian SRO 5 Fez (Morocco) 28-30 octobre 2008
2. *Dielectric relaxation and cation hopping at aluminosilicate surface: influence of water adsorption* **H. Belabji**, J.C. Giumtm, S. Devautour-Vinot, M. Kharroubi, A. Haouzi & F. Henn, BDS 2008, Lyon (France) 25-29 aout 2008
3. *Ionic liquids electrolytes. Synthesis and applications*. Haddad B., Fetouhi B., Benabdallah A., & **H.Belabji**. International Conference on emergent materials. Setif, (Algeria) 18-19 Feb. 2008.
4. *Modification of polymer electrode properties by electroplating* Benabdallah A., **Belabji H.** & Ilkiti H., International Conference for Renewable Energies and Sustainable Development- ICRSD-07, Tiemcen (Algeria) 21-24 May 2007.
5. *Etude et caractérisation d'un polymère conducteur électrodeposé sur différentes électrodes*. A.BENABDALLAH, H.BELARBI & H.ILLIKITI. JPA-2007, Tiarét,(Algeria) 06-08 May 2007
6. *Contribution à l'étude du piégeage par solidification de micropolluants contenus dans les déchets liquides*. L.BENZERROUK, A. KARAS, A.SASSI & **H.BELARBI**. JPA-2007, Tiarét, (Algeria) 06-08 May 2007
7. *Solidification et stabilisation des polluants org. Par des argiles modifiées*, B. Haddad, B.Fetouhi, H.Belabji, A. Haouzi, SIEPC'2005, Bejaia,(Algeria) 05-07/06/2005.
8. *Modified Clays for metallic waste storage (Cu, Ni,Co)* FETTOUHI B., HADDAD B., **BELARBI H.**, HAOUZI A. JNGP'2005, USTORan, (Algeria) 03-04 2005
9. *Experimental evidence of polarization effects on exchangeable cations trapped in montmorillonites*. A. Haouzi, **H. Belabji**, S. Devautour, F. Henn, J.C. Giumtm, Euroclay 2003, Modena (Italy), 22-26, June 2003
10. *Analysys of Broabdand Dielectric Spectra in Na⁺ Montmorillonite*, A.Haouzi, M.Kharroubi, **H.Belabji**, M.Rahmouni, S.Devautour, J.C.Giumtm, Euroclay 2003, Modena (Italy), 22-26, June 2003
11. *Impedance Spectroscopy study of modified montmorillonite*, 1st National Seminar on spectroscopy, DEHBI A., **BELARBI H.**, CHAHED L. Saïda, (Algeria), 15-17 Dec. 2002.
12. *Heavy metals storage « Cu²⁺, Zn²⁺, Cd²⁺ et Pb²⁺ » by modified montmorillonite*. DEHBI A., **BELARBI H.**, CHAHED L. Seminar on environmental Chemistry Tiarét, (Algeria) le 16,17 et 18 Dec. 2002.
13. *Process of polarization and analysis of water adsorption on a montmorillonite*, **BELARBI H.** et al. 2nd International Conference on Broabdand Dielectric Spectroscopy and its Applications, BDS 2002, Leipzig (Germany), 02-06 sep. 2002.
14. *Using MATHCAD Software in solving physical problems*. **H.BELARBI** 1st, National Conference on the physics didactic. Batna, (Algeria)20-23 nov. 1999,
15. *Thermally stimulated depolarization currents measured on exchanged clays*. **BELARBI H** et al. Meeting of French group of Clays, Paris (France) 25 Oct.1999

PROFESSIONAL EXPERIENCE

16. *Thermodynamical Analysis of montmorillonite Surface*. Medout-Marere, F. Morato, P. Thomas, **H. Belarbi**, J.C. Giuntini & J.M. Douillard, JCAT97, Dunkerque, (France) May 28, 1997
17. *Interpretation of polarization conductivity in homoionic dry montmorillonite*. **BELARBI H.** et al. Euroclay's 95, Leuven (Belgium), 20-26 aug. 1995.
18. *Correlation between the gap and charge density on semiconductors*. **BELARBI H.** et al. 3^e International meeting on materials science, Oran (Algeria), 27/28 Oct. 1990.

A) Teaching Experience.

2004- ... IBN KHALDOUN University
Taret, Algeria

Professor

1998 - 2004 IBN KHALDOUN University
Taret, Algeria

Associate Professor

Taught courses :-

1. Solid State physics (undergraduate and graduate level).

2. Materials synthesis (graduate level)

3. Inorganic Materials (graduate level).

4. Physical properties of materials (undergraduate level)

5. Interfacial phenomena (graduate level)

1990 - 1994 University of Taret
Taret, Algeria

Assistant Professor

Taught courses : classical mechanics- electromagnetism, analytical mechanics, statistical mechanics, computing for physicists, Solid State Physics etc...

1989 - 1990 University of Taret
Taret, Algeria

Instructor of physics, lab. Training supervisor.

B) Research experience

2005-2009 IBN KHALDOUN University
Taret, Algeria

Synthesis and Catalysis Laboratory

Research proposal: Ionic liquids. Synthesis and applications

Feb.2004 - Jul.2004 Visiting Professor, KFUPM Research Institute

Center of Environment & Water, Dhahran Saudi Arabia.

Research proposal: *solidification and stabilization of organic pollutants by modified clays.*

1998 - 2004 IBN KHALDOUN University
Taret, Algeria

Synthesis and Catalysis Laboratory

Research on modified clays for environment.

1994 - 1998 Montpellier II University
Montpellier, France

Condensed Matter Physical-Chemistry Laboratory.

Research on clays and water-clay systems.

1988 - 1990 Oran University
 Oran, Algeria
 Optics Laboratory:
Research on III-V and II-VI semiconductors chemical bonds.

C) Technical skills:

X-Ray Diffraction – DTA – DSC- EPR- Complex Impedance Spectroscopy, polarography, AAS, etc...
 D) Computer skills:

A good knowledge and ability in computing and computer science .

Languages: *FORTRAN-BASIC-PASCAL...*

Software's: *MATHCAD-PCMODEL-MOPAC-LABVIEW...*

E) Monitoring student research: Tiarat (1993)- Montpellier (1995)- Tiarat (1998)- Tiarat (2000)- Tiarat (2001)- Tiarat (2003)- Tiarat (2004), Tiarat (2005).

PROFESSIONAL MEMBERSHIPS AND AWARD RECEIVED

- External Reviewer IDB (2008)
- IDB Merit scholarship (2004)
- Member of Algerian Physical Society.
- Head of team in Synthesis & Catalysis laboratory .
- Member of project PNR2 OC 58903 (1999-2002).
- Member of Ada Project (1992-1993).
- Award of the best teacher at University of Tiarat (1992).

LANGUAGES

Arabic (Mother tongue) – French (First language) – English (second language).

REFERENCES

1. Professor **H. Aourag** Laboratoire d'étude et Prédiction de Matériaux Unité de Recherche Matériaux et Energies Renouvelables Université Aboubekr Belkaid Tiemcen B.P. 119 Tiemcen 13000 Algeria Tél.: 00 213 43 21 58 87 / 90 e-mail: h_aourag@mail.univ-tiemcen.dz
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