

***Synthesis and characterization of new materials to be applied
for hydrogen energy storage and water purification***

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Title of (M.Sc) Thesis:

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PURIFICATION*

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Statement

Beside the work carried out in this thesis, the candidate has attended and successfully passed an examination in post-graduate courses during the academic year 2005-2006 covering the following topics:

- | | |
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| 3. Quantum chemistry | 4. Nuclear chemistry |
| 5. Advanced analytical chemistry | 6. Catalysis and colloids |
| 7. Physical polymers | 8. Group theory |
| 9. Adsorption | 10. Electrochemistry |
| 11. X-ray diffraction and thermal analyses | 12. Electrode kinetics |
| 13. Advanced inorganic chemistry | 14. Volummetry |
| 15. Thermodynamics | 16. Mechanisms of inorganic chemistry |
| 17. Statistical thermodynamics | 18. Chelatimetry |
| 19. Solar energy | 20. German language |

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List of Abbreviations

XRD	:	X-Ray Diffraction
SEM	:	Scanning Electron Microscopy
IR	:	Infrared absorption Spectra
D.S.C.	:	Differential Scanning Caloremetry
T.G.A	:	Thermogravimtery Analysis
ESR	:	Electron spin resonance
CTAB	:	N,N,cetyltrimethylammoniumbromide
TEAB	:	Tetraethylammoniumbromide
CEC	:	Cation Exchange Capacity
BET	:	Specific surface area
PCT	:	Pressure Composition Temperature Isotherm

Chapter (I)

Introduction

Chapter (II)

Experimental

Chapter (III)

Results and Discussion

Summary

References

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ABSTRACT

Different types of titanosilicates (ETS-4, Natisite, and Sitinakite) were prepared using different precursors such as using natural SiO₂ from Red sea desert, without purification. Different techniques were used to characterize these titanosilicates such as XRD, IR, SEM, DSC-TGA, BET, ESR, ion exchanging and hydrogen energy storage. These studies showed that the prepared titanosilicates are well crystalline and possess high ion exchange capacity. Moreover, they exhibit shape selectivity towards adsorption of Cu²⁺ & Pb²⁺ ions from water where high adsorption was observed in case Pb²⁺ more than Cu²⁺ ions. Hydrogen adsorption isotherm measurements were carried out at -193°C up to 20 bars in titanosilicate samples, physisorption of hydrogen was observed and microporous structure of Sitinakite samples showed maximum hydrogen adsorption capacity more than dense structure of Natisite and microporous ETS-4.

Key words: Titanosilicates, Zeolites, water purification, Ion exchange, renewable energy, hydrogen storage energy.

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