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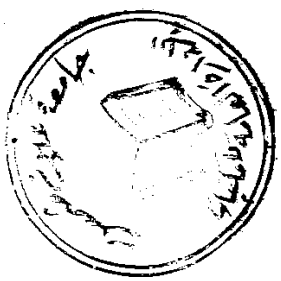
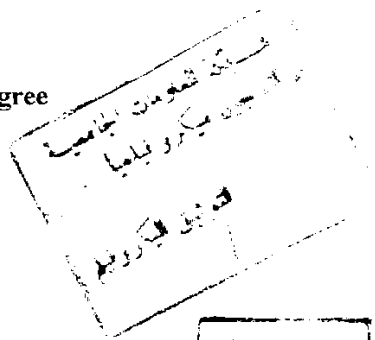
Department of Chemistry

PHYSICOCHEMICAL AND MECHANICAL PROPERTIES OF PORTLAND CEMENT PASTES CONTAINING SILICA FUMES



A Thesis submitted for
The Requirement of the Degree
of Doctor of Philosophy
In Chemistry



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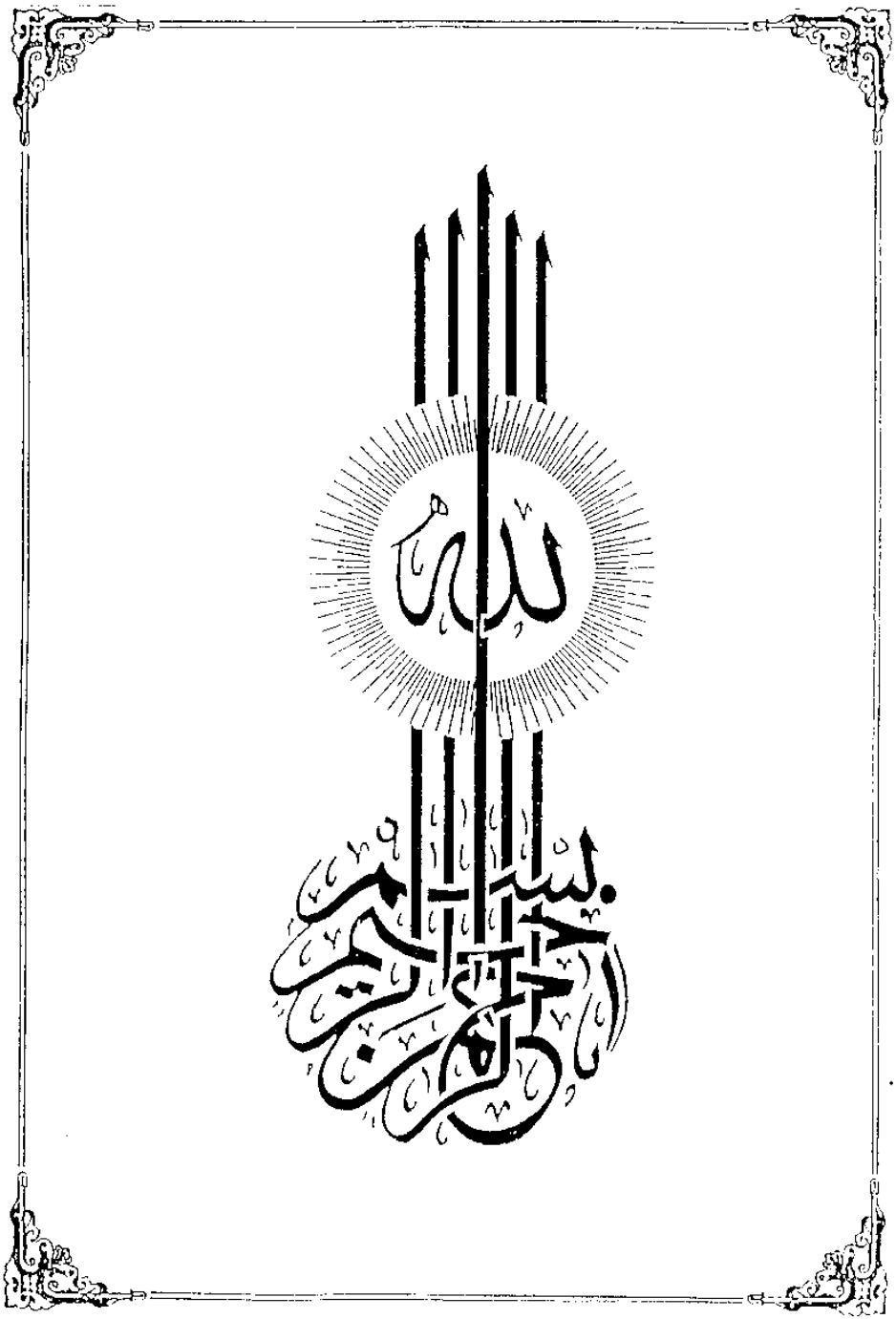

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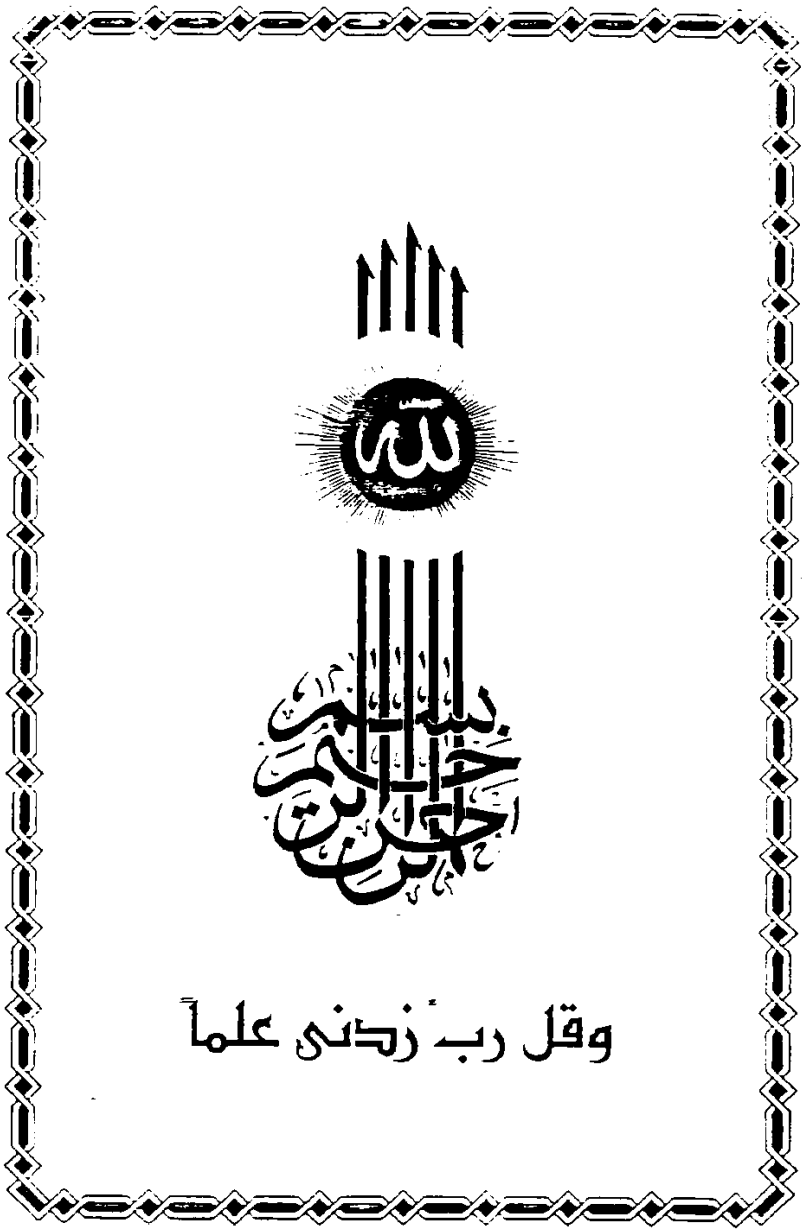

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ACKNOWLEDGMENT

I would like to express my greatest and deepest gratitude to Prof. Dr. Salah Abo-El-Enein, Prof. of physical chemistry, Faculty of Science, Ain Shams University, for suggesting the subject of this work, providing the facilities, his helpful supervising and continuous advises offered during conducting this work, and also his greatest help in interpretation of the results.

I would like to express my greatest and deepest gratitude to Dr. Fouad Ibrahim El-Hosiny, assistant Prof. of physical chemistry, Faculty of Science, Ain Shams University for his great help, his advises offered during conducting this work and also for his continuous guidance during this work.

I would like to express my deepest gratitude to Dr. Zeinab M. Abou Gamra, Lecturer of physical chemistry, Faculty of Science, Ain Shams University for her advice and her continuos interest during this work.

Finally, I wish to thank my husband Dr. Mousa A. Abd-Allah for his helps in the preparation of this thesis in its final form.

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ABSTRACT

Two hydration reactions were studied; these are: (i) Portland cement-silica fume hydration reaction at room temperature (under normal curing conditions), and (ii) Autoclaved Portland cement clinker-silica fume hydration reaction (under hydrothermal curing conditions). At the end of each hydration period, for the different curing processes, the specimens were tested for compressive strength, hydration kinetics, X-ray diffraction analysis and scanning electron microscopy. The addition of silica fume to Portland cement causes a slight modification in the values of the compressive strength for pastes made with water/solid ratio of 0.40 hydrated at room temperature. Also the results of compressive strength of autoclaved Portland cement clinker-silica fume specimens indicated that 15% silica fume represents the maximum addition to Portland cement clinker in order to produce high strength autoclaved building products suitable for specific applications; this represents the optimum composition of autoclaved Portland cement clinker-silica fume building products.

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