

Sudan University of Science & Technology  
College of Graduate Studies

# **Effects of Magnetized Mixing Water on the Properties of Concrete**

آثار مياه الخلط الممغنطة على خواص الخرسانة

By

**Abd Allah Salah Abd Allah**

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Supervisor:

**Prof. Dr. Ahmed Eltayeb Ahmed**

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# DEDICATION

*To my:*

*Father's, Mother, Teachers,  
Brothers, sisters and friends*

*With gratitude and love*

Abd Allah, S, A

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## الملخص

تعتمد مقاومة الخرسانة على تفاعل الإماهة ويشكل الماء دوراً مهماً بالأخص الكمية المستعملة. عند إستعمال ماء قليل تزيد مقاومة الخرسانة. تفاعل الإماهة في حد ذاته يستهلك كمية من الماء. تخطط الخرسانة بمياه أكثر من التي تحتاجها عملية الإماهة، هذه المياه الإضافية تضاف لكي تعطي الخرسانة تشغيلية كافية، اذ أن إنسياب الخرسانة يكون مرغوباً فيه لتحديد التعبئة وتكوين الشكل. إن المياه التي لا تساهم في تفاعل الإماهة سوف تبقى في شكل فجوات تجعل الخرسانة ضعيفة نسبياً للمقاومة المتمثلة في روابط إماهة سيليكات الكالسيوم، بعض الفجوات لا تشكل أهمية عندما يتم دمك الخرسانة وإستعمال المياه الممغنطة.

أحد الخصائص الأساسية للمياه المعالجة مغناطيسياً التي تشكل أهمية في صناعة الخرسانة هي مشاركتها للجزيئات والمحاليل مثل أيونات المحلول ( محلول جزيئات الأسمنت المذاب في المياه الممغنطة) التي تحتوى على جزيئات محاطة بطبقة رقيقة وكثيفة من الجزيئات الأحادية الواقعة تحت تأثير المجال المغناطيسي.

هذا البحث يهتم بتقويم عملي لتأثير المياه الممغنطة على بعض الخواص الهندسية للخرسانة في الحالة اللدنة والصلبة. لقد أثبتت نتائج إختبارات الخرسانة التي إستعملت فيها مياه ممغنطة زيادة ملحوظة في التشغيلية وتحسين المقاومة بنسبة 50% مما يمكن من تخفيض نسبة الأسمنت المستخدم بنسبة 25% غير أن زمن الشك يقل مقارنة بالخرسانة التي أستخدمت فيها مياه غير ممغنطة.

## ABSTRACT

The strength of concrete is very much dependent upon the hydration reaction. Water plays a critical role, particularly the amount used. When less water is used to make concrete, strength of concrete increases. The hydration reaction itself consumes a specific amount of water. Concrete is actually mixed with more water than is needed for the hydration reactions. This extra water is added to give concrete sufficient workability. Flowing concrete is desired to achieve proper filling and composition of the forms. The water not consumed in the hydration reaction will remain in the microstructure pore space. These pores make the concrete weaker due to the lack of strength-forming calcium silicate hydrate bonds. Some pores will remain no matter how well the concrete has been compacted and has been used magnetized water.

One of the basic characteristics of magnetically treated water, which has major importance in concrete making, is its pertaining to colloidal particles and solutions. Like ion solution (colloidal cement solution is made with magnetized water), colloidal cement solution will contain colloidal particles, surrounded by a thinner dense layer of water mono-molecules as the number of mono-molecules drops at some regimen of magnetic treatment. Therefore, some reduction of water share in cement mixture is possible.

This investigation deals with the experimental evaluation of the effect of magnetic water on some of the engineering properties of concrete. The properties studied were those of both fresh and hardened states of concrete.

In order to evaluate the effect of the parameters tested alone, without the possible intervention of the other variables might mask the over all picture, it was felt necessary to adopt satiric control over the quality of the materials used through the whole investigation, this minimizes the effect of the variation in materials quality and gives higher confidence when interpreting the result.

The results showed that the workability and strength of concrete mixes made with magnetized water were increased with 50% which may result in a possible reduction of cement by 25%; however the setting time was shortened compared to that of mixes which used local tap water.

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