

MyConcrete:

*The Bulletin of the American Concrete
Institute – Malaysia Chapter*



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Malaysia Chapter**

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Institute – Malaysia Chapter*

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American Concrete Institute – Malaysia Chapter

American Concrete Institute - Malaysia Chapter (ACI-Malaysia) is a non-profit technical and educational society representing ACI Global in Malaysia, which is one of the world's leading authorities on concrete technology. Our members are not confined to just engineers; in fact, our invitation is extended to educators, architects, consultants, corporate, contractors, suppliers and leading experts in concrete related field. The purpose of this Chapter is to further the chartered objectives for which the ACI was organized; to further education and technical practice, scientific investigation, and research by organizing the efforts of its members for a non-profit, public service in gathering, correlating, and disseminating information for the improvement of the design, construction, manufacture, use and maintenance of concrete products and structures. This Chapter is accordingly organized and shall be operated exclusively for educational and scientific purposes.

Our Objectives

- ✓ **ACI is a non-profitable technical and educational society formed with the primary intention of providing more in-depth knowledge and information pertaining to the best possible usage of concrete.**
- ✓ **To be a leader and to be recognized as one of Malaysia's top societies specializing in the field of concrete technology by maintaining a high standard of professional and technical ability supported by committee members comprising of educators, professionals and experts.**
- ✓ **Willingness of each individual member/organization to continually share, train and impart his or her experience and knowledge acquired to the benefit of the public at large.**

Join Us Today! **Benefits such as:**

- Individuals, professionals, corporate, students can interact and widen their networking.
- A one-stop centre where educators & members can contribute their areas of expertise by sharing and presenting topics related to concrete technology at seminars organized by ACI-Malaysia on a monthly basis.
- ACI-Malaysia can assist members to resolve technical issues, seek professional assistance and even development of solution to their existing problems.
- Individual or corporate members can send their employees to attend seminars organized by ACI-Malaysia to learn and re-learn any topics that relate to concrete technology and to improve their technical knowledge which will assist in their work to reduce and avoid any reworks and repairs.
- Participate in seminars and networkings at an affordable price.
- Our institution will organize hands-on trainings which will benefit any intellectuals or fresh graduates and prepare them for work in the real work environment.
- An institution where members can contribute to our bulletins to keep our members informed of what is new in the concrete industry and the latest developments and innovations around the world. Our website will keep you informed and updated on what is coming along the concrete technology pipelines.
- Corporate members will enjoy the benefits of being able to pick and recruit fresh graduates from the large pool of student members.
- ACI-Malaysia Library where members can source information on articles published, gain access to

Register now. . .

We look forward to your kind support and, more importantly, to your participation and registration as a member of ACI-Malaysia Chapter. It is our firm belief your involvement and together with your commitments will go a long way in our quest to uphold all our objectives to mutually benefits for all members.

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Importance of the pH for Cement-Based Materials

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ABSTRACT

Naturally, concrete has high pH value due to portlandite and alkali metal contents in Portland cement. The pH of concrete may decrease with time due to the penetration of different defect causing agents like carbon dioxide, gases, chlorides and moisture. The main processes involved in pH reduction of concrete are, carbonation, corrosion, chloride ingress, biodegradation and acid attack. Reducing pH of concrete have negative impact on the strength, durability and service life of concrete buildings. However, high pH of concrete may also cause deterioration in concrete.

INTRODUCTION

The cement-based materials (CBMs) such as concrete, mortar and paste start their life at a high pH of about 12.5 to 13.5 due to the presence of portlandite. The portlandite is byproduct of the hydration process of Portland cement and the main reason of high pH of CBMs [1, 2]. The pH of CBMs does not remain constant and varies with time due to a number of factors. These factors include carbon dioxide, acidic gases, chlorides and moisture that can penetrate into the embedded reinforcement through the process of infiltration, diffusion and capillary action [3, 4]. The main processes involved in pH reduction of concrete are carbonation, corrosion, chloride ingress, biodegradation and acid attack [5].

The strength, durability, sustainability and service life of concrete buildings are directly influenced by their pH values. The authors [6] stated that calcium hydroxide and other

alkaline hydroxides present in the concrete pore solution maintain the durability of concrete building structures. According to Alotaibi [7], the high pH value of good quality concrete offers the best protection to embedded reinforcement against destructive agents. Therefore, it is very necessary to provide full protection to the concrete buildings against penetration of any defect causing agent. The maintained pH value of good quality concrete can protect the passive layer of reinforcement for hundreds of years from damaging. Both, low and high pH values of concrete are dangerous for the strength, durability and service life of concrete structures. Therefore, the aim of this study is to describe the problems and defects due to low and high pH values and importance of pH value of concrete building structures.

CONCRETE WITH LOW pH

The pH of concrete drops after setting due to the consumption of portlandite in the formation of hydration products. The hydration products may become unstable due to reduction in the pH value of concrete. Behnood et al. [8] described that when concrete is exposed to air, its pH value decreases from its outer to inward surfaces. This reduction in pH is mainly due to the process of carbonation as shown in Figure 1 [9]. The pH may also reduce due to cracking and rusting from corrosion, chloride ingress and acid attack. In addition, due to the growth of fungi and bacteria on concrete surfaces, the pH of concrete decreases and its porosity increases [4, 5, 10].

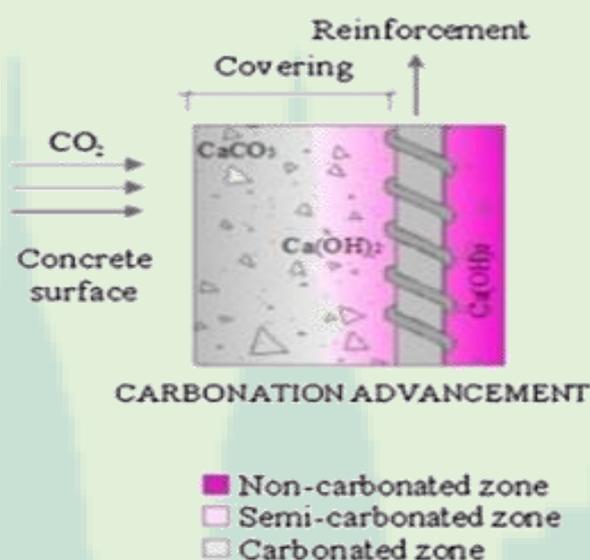


Figure 1. Carbonation process of concrete [9]

CONCRETE WITH HIGH pH

Berube et al. [11] stated that the alkali silica reaction in concrete is resulted from high pH value of concrete. The alkali silica reaction may cause cracking, expansion and damaging of concrete as shown in Figure 2 [12]. In addition, the high pH value of concrete results in moisture related damages and porosity of concrete. Therefore, this is advantage of low

pH of concrete to avoid alkali silica reaction and porosity in concrete structures.



Figure 2. Pattern cracking due to alkali silica reaction [12]

CONCLUSION

This study has concluded that both, low and high pH values of concrete are dangerous for the strength, durability and service life of concrete building structures. Naturally, concrete has high pH value of about 12.5 to 13.5. However, pH value of concrete reduces due to the consumption of portlandite in the cement hydration process. Also, pH value of concrete reduces due to its exposure to ambient air as a result of carbonation, corrosion, chloride ingress, acid attack and biodegradation process. The low pH value of concrete can cause various building defects such as corrosion of reinforcing steel bars, surface cracking, spalling of concrete cover, less durability, porosity and low service life of concrete building structures. However, expansion and damaging of concrete due to alkali silica reaction is resulted from its higher pH value.

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Past Events

ACI-Malaysia Seminar on Advanced and Sustainable Concrete Technology, 21 March 2019

We had an outstanding Seminar on Thursday, 21st March 2019. With Professor Hamidah Mohd. Saman (UiTM), Assoc. Prof. Johnson Alengaram (UM), Dr. Payam Shafigh (UM), Mr. Jasson Tan (Dura Technology), Assoc. Prof. Mohd. Alias Yusof (UPNM) and Dr. Lai Fook Chuan (Hartalega) as speakers.

- ✓ In conjunction with the International Construction Week 2019 & ASEAN Super 8
- ✓ Jointly organized by American Concrete Institute - Malaysia Chapter, Universiti Teknologi MARA (UiTM) & Concrete Society of Malaysia (CSM)



2018 ACI-Malaysia 22nd Annual General Meeting and Gala Dinner, 26 April 2019

Celebrated the 22nd year of establishment of the American Concrete Institute - Malaysia Chapter with an outstanding event. The event would not have been possible without the generous support of our sponsors.

- Platinum Sponsor: Dura Technology Sdn. Bhd.;
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 Bronze Sponsors: Adept Technical Services Sdn. Bhd., Al-Ambia Sdn. Bhd., and Green Cement Sdn. Bhd..




Past Events

Networking Dinner

ACI-Malaysia hosted a Networking Dinner at the rooftop of Best Western Hotel Petaling Jaya, Selangor, Malaysia on September 26, 2019.

✓ Sponsors: Bekaert and Maha Chemicals



Seminar on Concrete Construction Towards Digitalization

In conjunction with MBAM OneBuild 2019

As the affiliate partner, ACI-Malaysia conducted 9 short seminars regarding concrete on October 30 and 31, 2019 at the Hospitality Lounge 1 & 2 of Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia.



ACI - ASC conference in Singapore

Friday, 8 November 2019 at Temasek Polytechnic, Singapore

Signing of Memorandum of Understanding between ACI-Malaysia, ACI-India, ACI-Philippines, ACI-Singapore and Temasek Polytechnic took place in Singapore, in conjunction with the ACI-ASC Conference 2019.

The MOU formalizes the cooperation between the Institutions in the areas of Membership Benefits, Trainings, Seminars and Conferences, Consultancy Services and Exchange Program.





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- *A printable ACI membership certificate.*

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