



**Ash Development
Association of
Australia**

**16
MAY**

COAL ASH matters

THIS ISSUE - MAY 2016

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www.adaa.asn.au

Editorial

Being an industry Association, the Ash Development Association of Australia (ADAA) operates for the benefit of members. The constant challenge is to meet ALL members expectations in terms of outcomes across our brief of; (1) advocacy, (2) research focus and (3) communication. Achieving consensus and understanding across a multi-stakeholder group is not easy. This edition highlights consensus and collaboration achievements like Standards Australia, Government and Research bodies.

Justin Flood from Sunset Power International (trading as Delta Electricity) and Chairman of the Association provides update of the changes occurring throughout the entire business including the recently purchased Vales Point power station from the NSW Government in December 2015.

Following four (4) years of extensive consultation, Standards Australia working committee BD-031 finalised "AS/NZS 3582.1 Supplementary cementitious materials Part 1" to supersede "AS 3582.1-1998, Supplementary cementitious materials for use with portland and blended cement, Part 1: Fly ash." in February. This well overdue revision provides numerous 'new pathways' for utilization.

We report on an update of The Australasian Procurement and Construction Council (APCC) with the release of their 2nd ed. "Procurement of Construction Products - A guide to achieving compliance". This 2nd Edition is aimed at assisting anyone involved in the building industry to ensure the building products they select, buy and install meet Australian building standards. The guide fills the gap in credible and accurate information on 'safety critical' products, in order to determine whether or not a product is fit-for-purpose.

The Australian Research Council (ARC) announced a \$340,000 grant to further the research for green concrete, led by University of Southern Queensland (USQ). This grant allows employment of extra research staff and PhD students to continue their development of a geopolymer-based "green" cement. The successful 'commercial' development of the geopolymer-based cement will further reduce the reliance on Portland Cement in the construction industry.

The end of 2015 also saw the US Patent and Trademark Office grant Orbite Technologies Inc. a patent titled "Processes for Treating Fly Ash". The patent covers selective extraction and recovery of valuable elements such as scandium, gallium and rare metals such as alumina, magnesium oxide and titanium dioxide from fly ash, using Orbite's 'chloride-based' technology. An important strategic focus in the US technology sector, with China providing more than 85% of all rare earth metals.

We wrap up with some interesting stories, such as research into converting carbon dioxide into sustainable concrete, news from the Cooperative Research Centre for Low Carbon Living, Stockpiling fly ash and more!

Conferences:

This year a number of domestic and international conferences will be held; including Coal Ash Asia, hosted by the Asian Coal Ash Association from the 22-26 September 2016 in Shouzhou, Shanxi Province, China. Coal Ash Asia 2016 features 3 days of conference networking, seminars, exhibition and business matching.

The biennial Construction Materials Industry Conference (CMIC) is also on again in 2016. The event is on from 25th -28th October 2016 at the Melbourne Convention and Exhibition Centre. Further details will be announced in the coming months. The Association is currently considering a presence at the conference to further disseminate information about Coal Combustion Product's to other industry groups.

Lastly the Association welcomes Ms Breannan McMahon, replacing Lauren Hatton at HBM Group. Bre is currently studying a Bachelor of Commerce at the University of Wollongong, hoping to major in marketing and public relations. We wish our members and all readers a productive coming year, happy reading!



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Views expressed in Coal Ash Matters newsletter do not necessarily reflect the opinion of the Ash Development Association of Australia. All contributions are welcomed, though the publisher reserves the right to decline or edit for style grammar, length and legal reasons. ©2005-16.

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Membership

COMPANY MEMBERS

A primary role of the ADAA is to bring together producers and marketers of coal combustion products (CCPs). Our activities cover research and development into CCP usage, advocacy and technical assistance to CCP producers and users, as well as a forum for the exchange and publication of CCP information.

For more information on the Association, visit us at www.adaa.asn.au

- Adbri Resources
- Adbri Masonry
- BG&E - Materials Technology
- Boral Quarries & Recycling
- Bulk Flyash Grouts
- Classique Environment Solutions Pty Ltd
- CS Energy
- Delta Electricity
- Golden Bay Cement (New Zealand)
- Heeleys Consulting
- Hyrock (NSW)
- Intergen (Millmerran)
- Latrobe Magnesium
- LLIS Industrial (formerly Conneq Industrial Infrastructure)
- NRG Gladstone Power Station
- Origin Energy Eraring Power Station
- Roads and Maritime Services
- Stanwell Corporation
- Sunstate Cement
- Synergy (Verve Energy)
- Vecor Australia
- Wagners Cement

RECIPROCAL MEMBERSHIPS

- CSIRO www.cmit.csiro.au
- Association of Canadian Industries Recycling Coal Ash (CIRCA) www.circainfo.ca
- European Coal Combustion Products Association (ECOBA) www.ecoba.org
- UK Quality Ash Association www.ukqaa.org.uk
- American Coal Ash Association www.aaaa-usa.org
- World Wide Coal Combustion Products Network (WWCCPN) www.wwccpn.org

MEMBER EMPLOYEE PROFILE

Justin Flood

Sunset Power International

How did you come to work at Sunset Power International and what have you learnt there?

Sunset Power International bought Vales Point power station from the NSW Government in December 2015. Previously a state owned corporation, owned and operated Vales Point along with Mt Piper, Wallerawang, Munmorah and Colongra power stations. Progressively all power stations were sold or closed until there was only Vales Point. It's been an exciting and hectic 3 months under the new owners and probably a little early to reflect back on learnings.

What is the importance of coal combustion products (CCPs) to your industry?

Vales Point power station operates with an ash dam for disposal of CCPs. Once the ash dam is full, alternatives for CCP disposal are expensive. Increased utilisation of CCPs not only ensures that the life of the power station is not unnecessarily cut short but also increases the viability of operations by keeping costs down. In an era where carbon emissions are important, utilisation of CCPs also improves the sustainability of operations.

How did you develop your technical knowledge?

I have been involved in the power industry for 25 years, starting out as a Mechanical Engineer. I have also worked across a variety of disciplines such as environmental, electrical and civil engineering. Due to the diversity available in a large industrial setting, I have managed to gain experience in not just coal fired generation, but also gas turbines, wind farm development and hydro generation. Who knows, maybe solar will become a future part of the generation portfolio at Sunset Power International.

Compared to other past employers, how does Sunset Power International compare?

The change from large government corporation to a privately owned business has been refreshing. The change has been welcomed as procedures and processes become more efficient.

What are your roles and responsibilities at Sunset Power International?

As Executive Manager Sustainability I have a wide range of responsibilities. They include environmental management and compliance, the biomass co-firing program and fuel supplies at Vales Point power station as well as business development. There are several opportunities we are looking at but it's too soon to make any public announcements.

Are there any new interesting projects Sunset Power International has taken on recently and what does it involve?

There are a few interesting projects we are working on. Some pre-existing projects are being continued such as use of our biomass converter technology. The converter makes char from biomass and thus removes the current restraints around using pulverising mills to process biomass. Hopefully, with the ownership of Vales Point power station now certain after some 5 years of various sales and off-take agreements, the business can enable investment to increase the amount of CCPs that are beneficially utilised.

Is Sunset Power International involved in any industry or support groups?

In addition to the ADAA, Sunset retains membership of the Energy Council of Australia and also has membership as the Australian generator representative on the Coal Industry Advisory Board to the International Energy Agency.



AS/NZS 3582.1, AS 3582.2 and AS/NZS 3582.3

are now available for purchase
through SAI Global

'AS/NZS 3582.1 Supplementary cementitious materials Part 1: Fly ash' was prepared by the Joint Standards Committee BD-031, (Supplementary Cementitious Materials), to supersede AS 3582.1–1998, Supplementary cementitious materials for use with portland and blended cement, Part 1: Fly ash.

The formal committee work commenced back in 2014, following 4 years or pre-consultation with members, stakeholders and wider industry users. Standards members in both Australia and New Zealand, decided to develop this Standard as a Joint Standard.

The objective of this Standard is to set out the requirements for fly ash for use as a cementitious material in concrete, mortar and related applications. The principal differences between this and the previous edition are the introduction of new grades of fly ash, recognition of proven and unproven sources, amendments to sampling and testing requirements. The Standard now aligns with AS 2758 in terms of requirements for mitigating alkali silica reaction in concrete. It also aligns with AS3972.

The term 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance. Notes used in this Standard are of an advisory nature only and are used to give explanation or guidance to the user on recommended considerations or technical procedures, or to provide an informative cross-reference to other documents or publications. Notes to clauses in this Standard do not form a mandatory part for compliance with this Standard.

AS/NZS 3582.1 Supplementary cementitious materials Part 1: Fly ash, can be purchased online at SAI Global here:
<http://infostore.saiglobal.com/store/>

STANDARDS
Australia

SAI GLOBAL

Agriculture: Market Opportunities for Coal Ash

by Jane Aiken

Australia will be one step closer to achieving reduced CO₂ emissions and achieving environmentally sustainable practices if we can manage new industries using resources as by-products from old industries. It is in this space that an alternative Australian fly ash industry may emerge, bringing with it innovative leaders and entrepreneurs to incorporate fly ash as an integral part of their business.

One solid performer in the alternative use of fly ash has been the use of furnace bottom ash (FBA) as a material for soil mixes, especially the soils being used as landscaping materials for green and high rise walls and roof top gardens. Through these applications, the use of fly ash in soils has become the catalyst for the furnace bottom ash product to stand as an integral component of modern architecture and the building and construction industries for Australian cities.

Lightweight soil mixes are an essential commercial commodity, but supply of this resource is being reduced as coal fired electricity is now supplemented with solar and wind generation. Currently, the market for soil in high-rise construction is increasing but obtaining the furnace bottom ash material is difficult. Consequently, for the businesses that are pioneering the use of fly ash in soil applications, they now have considerable commercial risk.

So what is the real problem this industry needs to solve?

The technical aspects of use? No, we have solved and innovated applications for using fly ash, which includes manufactured products, use in agricultural soils and civil uses. The problem is a lack of infrastructure for ash reuse. Power stations were not built to supply fly ash commercially, rather they were built to supply electricity supplied into a national grid and any resulting fly ash was managed as a waste. Therefore the challenge for the future will be to design systems, which are built to include fly ash as part of the end product, not as a waste. An example of an ADAA member currently working on developing these systems will be examined in Coal Ash Matters: October 2016.

This article has been written by Dr. Jane Aiken. Dr Aiken is an advocate for the use of fly ash for agriculture across Australia.

Procurement of Construction Products

A guide to achieving compliance

The Australasian Procurement and Construction Council (APCC) has released the second edition to the widely recognised "Procurement of Construction Products – A guide to achieving compliance". The Guide is aimed at assisting anyone involved in the building industry to ensure the building products they select, buy and install meet Australian building standards. The Guide fills the gap in credible and accurate information on 'safety critical' products, to verify construction product conformance, in order to determine whether or not a product is fit-for-purpose.

The Guide now recognises 34 industry led product accreditation schemes and guidance information across a range of building product categories including:

- Reinforcing and structural steel
- Cementitious materials for concrete
- Wood products
- Glazing products
- Electrical products
- Fire safety services
- Plumbing products
- Insulation products
- Coating products
- Building products.

The Guide is an important and valuable contribution to the building and construction industry. This Guide has been jointly developed with the Ash Development Association of Australia involvement along with thirty (30) key construction industry stakeholders and supported by many others.

"The Guide will increase awareness, provide guidance, understanding, and improved decision making in the procurement and compliance issues of construction products. It is hoped that the Guide will provide procurers with greater clarity, reduce confusion and assist in demystifying matters relating to the conformance of construction products in Australia. The guidance and conformity assessment schemes included in the Appendix provide useful and practical information and reference for procurers. The Guide fills an existing void by providing a solid non-regulatory and invaluable tool for the procurement of construction products in Australia and providing a level of confidence for all stakeholders involved in building and construction project delivery." Said Teresa Scott, Executive Director of the APCC.

Download a copy - <http://www.apcc.gov.au/SitePages/Construction%20Product%20Quality%20Guide.aspx>



Global 'fly ash' market is expected to reach US \$64.76 billion by 2022

The compound annual growth rate (CAGR) of the fly ash market is expected to expand at 7.3% from 2016 to 2022, making the overall value in 2022 almost double the value in 2015. This information is derived from Credence Research's most recent market report, "Fly Ash Market – Growth, Share, Opportunities, Competitive analysis and forecast 2015-2022". From a value of \$39.54 billion (USD) in 2015 to an expected value of \$64.76 billion in 2022, its no wonder fly ash is being recognised as a valuable resource instead of a waste.

The larger share of the global fly ash market in 2015 was utilised through Portland cement replacement. The substitutes for soil stabilisation using fly ash accounted for 14% of the market and this percentage is only expected to rise in the near future. Reduced water requirements and improved workability are key trends that fly ash espouses, along with decreased permeability and increased compressive strength.

Ultimately, these factors collectively result in an increasing demand for fly ash on a global level and overall; it is only going to become more popular throughout multiple industries.

Read more here:

<http://www.pdfdevices.com/fly-ash-market-is-expected-to-reach-us-64-76-bn-by-2022-credence-research>



Orbite International Receives U.S Patent for Fly Ash Monetization

At the end of 2015, The United States Patent and Trademark Office granted Orbite International a patent titled "Processes for Treating Fly Ash". The patent covers selective extraction and recovery of valuable elements such as scandium, gallium and rare metals, alumina, magnesium oxide and titanium dioxide from fly ash, using Orbite's chloride-based technology.

This patent clears the way for Orbite to pursue the commercial application of its unique technology in the U.S. where upwards of 75 million tonnes of fly ash produced annually and stored represents a significant environmental and economic liability to generators.

The patent allows Orbite to extract all the individual components selectively. The Orbite process will attempt to turn these liabilities into exploitable assets.

The Company has successfully applied for accelerated examination and processing under the Patent Prosecution Highway in jurisdictions participating in this program. Furthermore, since the parent patent applications were deemed to contain a plurality of innovations, the Company filed a divisional patent application in Canada and the United States.

The Canadian Innovation Exchange (CIX) named Orbite in the Top 20 Most Innovative Public Technology companies in 2015, coinciding with the announcement of the successful patent.

Researchers Turn Carbon Dioxide into Sustainable CO₂crete

The burning of coal to make electricity creates two major by-products, fly ash and CO₂. The ADAA and its members are currently doing everything possible to increase the utilisation of fly ash in the hopes of lessening the impact of burning coal on the environment. Although the utilisation of fly ash has been progressive, CO₂ has become viewed as a pollutant with significant impacts on global warming, until a team of researchers at the University of California, Los Angeles (UCLA) claim to have created a solution that may help eliminate these sources of greenhouse gases.

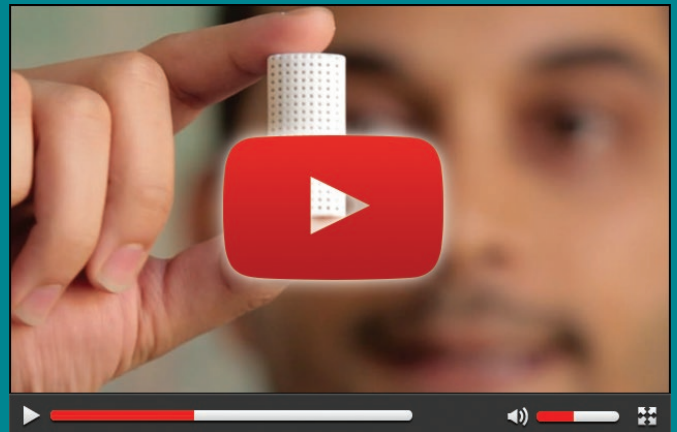
The idea...

Capture carbon from source, using a filter system and then transforming the CO₂ into a solid, and using it as a building material. This "closed-loop process" which they are calling CO₂crete would therefore "up cycle" the gas from a waste, to a reusable solid for construction purposes.

"What this technology does is take something that we have viewed as a nuisance — carbon dioxide that's emitted from smokestacks — and turn it into something valuable," said J.R. DeShazo, professor of public policy and director of the Luskin Centre for Innovation at the UCLA. "I decided to get involved in this project because it could be a game-changer for climate policy," DeShazo said. "This technology tackles global climate change, which is one of the biggest challenges that society faces now and will face over the next century."

As we know, the process of making concrete and CO₂ emissions are some of the largest contributors to greenhouse gas emissions in the world.

Although the team at UCLA is only in the development stage of the research, their work can potentially lessen the greenhouse effect.



The Association will endeavor to provide updates of UCLA's research as it advances.

Find out more at: <http://newsroom.ucla.edu/releases/ucla-researchers-turn-carbon-dioxide-into-sustainable-concrete>



GREEN CONCRETE

In November, the Australian Research Council (ARC) announced a \$340,000 grant to further the research into green concrete, led by University of Southern Queensland (USQ). The grant allows the project to employ extra research staff and PhD students to continue their development of a geopolymer-based “green” cement. The successful development of the geopolymer-based cement will further reduce the reliance on Portland Cement.

The project entitled ‘Development of Viable Geopolymer as the Sustainable, Low CO₂ Alternative to Portland Cement’, includes USQ researchers, CSIRO members and international experts from the United Kingdom and China. According to USQ’s project leader Professor Hao Wang, “Securing this ARC Discovery funding is great news for USQ, and for regional universities, because it can help to solve not just a local problem but a global problem.”

According to Wang, Global cement and concrete production totals approximately 35 billion tonnes per year and is the second most used commodity, behind water. It also accounts for a staggering 8% of global carbon dioxide emissions.

“The estimated CO₂ savings of using geopolymer cement as opposed to Portland cement can be up to 80 per cent,” Professor Wang said. Unlike Portland cement, the green cement does not rely on unsustainable resources including limestone and clay, It also does not require heating to excessive temperatures for calcination, the process by which even greater amounts of carbon dioxide are emitted.”

Wang has also expressed concerns about the “The absence of knowledge about the alkali activation reaction and the methodology of effectively evaluating fly ash as the raw material has become a major barrier for geopolymer cement to be fully adopted by civil and construction industries, where predictable and reliable performance is critical.”

One of the essential aims of the project is to develop a **fly ash reactivity index**. This will be completed by testing various properties of numerous grades of fly ash from Tarong, Callide, Gladstone and Millmerran power stations in Queensland, and Eraring in NSW. This will enable cement manufacturers to evaluate the properties of the fly ash and will indicate the amount of alkali activator needed to mix with it to create a geopolymer of determinate properties.

UKQAA STOCKPILE FLY ASH PROJECT

For a long time, there has been a considerable demand for fly ash products in the UK construction and engineering sectors. The UKQAA (UK Quality Ash Association) recently produced its Ash Availability Report, which showed that since the turn of the century, the construction industry has typically consumed half of the ash produced annually.

Planned closures of coal-fired power stations across the UK will have a significant impact on the UK's future energy mix, but the UKQAA is confident about the supply of coal ashes (fly ash and furnace bottom ash) for construction products both now and in the foreseeable future.

In 2014, more than 50% of the fly ash produced was used for construction products, varying from the manufacture of cement, Type 1 and 2 concrete additions and concrete blocks to AAC blocks and grout. In addition, around 20% was used as a construction material in engineering fill or land reclamation projects. The report also finds that of the 5 million tonnes of fly ash produced on average annually, approximately 30 % remains surplus. This equates to around 2 million tonnes a year, adding to existing stockpiles of up to 50 million tonnes of potentially usable fly ash across the UK.

This mostly untapped resource will become a valuable complementary raw material if correctly processed. The UKQAA is working with researchers in the UK to maximise the beneficial use of coal fly ashes over the next decade and support recovery of raw material from ash stockpiles.

The Association is involved with the Innovative Processing of Stockpile Ash Project at the University of Dundee. The research will hopefully shine light onto reclaimed stockpile ash and its benefits of use as a high quality material, suitable for use in structural concrete.

In contrast there is more than 400 million tonnes of coal combustion products stored in stockpiles across Australia which could be exploited. The Ash Development Association of Australia is currently exploring projects through the Cooperative Research Centre for Low Carbon Living to potentially reclaim for use.



Conference: CMIC16

Capability and Innovation



The biennial Construction Materials Industry Conference is on again in 2016. The event will run from 25th - 28th October at the Melbourne Convention and Exhibition Centre.

Further details are expected to be announced in the coming months. The Association is currently considering a presence at the conference to further disseminate information about Coal Combustion Product's to other industry groups.

The Exhibition Centre will be re-energised with a focus on maximum delegate flow and exposure for exhibitors. The Centre will also feature a "Dedicated Vendor Innovation Portal" where new products can be tried and tested by delegates and exhibitors through a series of technical industry presentations.

PROGRAM

The welcome reception on Wednesday night is set to energise delegates for the official Conference opening on Thursday. The next two days of the event will be packed to the rafters with high profile, dynamic thought leaders.

On Thursday night at the National Gallery of Victoria, the Premier Gala Dinner will commence to celebrate the industry achievements over the past two years. A closing 'Business Leaders Lunch Forum' will be held on the Friday and will give delegates a perfect opportunity to say goodbye to new and old contacts.

IMPORTANT DATES

- 16 August 2016** Early bird registration closes
- 11 October 2016** Standard registration closes
- 26 - 28 October 2016** CMIC16



MEMBERSHIP SURVEY REMINDER.....

For those companies who have received the membership survey, just a reminder that this needs to be returned ASAP in order for the results to be aggregated and reported. These figures will also be used to determine appropriate membership dues for the coming year.





Concrete 2017 will be the 28th Biennial National Conference of the Concrete Institute of Australia and will be held in the beautiful city of Adelaide, South Australia.

The conference will focus on the theme Advances in Concrete Materials and Structures. The Conference is dedicated to bringing together global leaders in the concrete industry, and will consider all aspects of concrete materials and structures – design, research, construction, maintenance and repair.

ANOTHER INTERNATIONAL PARTNERSHIP....

The Conference is also host to the 3rd International Congress on Durability of Concrete (ICDC), an international forum for exchanging research results and displaying how concrete will continue to create durable buildings and structures for sustainable development in both local and global contexts. Concrete 2017 will offer participants from around the world the opportunity to connect face to face and share innovative and interesting ideas from the latest advances in concrete materials to the design and construction of fascinating concrete structures.

KEY DATES

Call for Abstracts Opening:	11 April 2016
Call for Abstracts Closing:	14 October 2016
Abstract Author Notification:	25 November 2016
Full Paper Submissions Close:	10 February 2017
Full Paper Author Notification:	2 May 2017
Author Registration Deadline:	26 May 2017
Conference Dates:	22-25 October 2017

International Congress on Durability of Concrete

The 3rd International Congress on Durability of Concrete (ICDC) will be held directly following the conference. The congress, which is also to be hosted by the CIA will afford an opportunity for durability experts and practitioners from Europe, Asia, North America and South America, to meet with local Australian and New Zealand delegates to present, discuss, and share developments in concrete durability from all over the globe.



Coal Ash Asia 2016

Asian Coal Ash Association will hold the Coal Ash Asia 2016 (CAA 2016) Conference from the 22nd -26th September in Shouzhou, Shanxi Province, China. Coal Ash Asia 2016 features 3 days of technical presentations, seminars, exhibition and business matching.

The response from the international community has already been very positive, with confirmed participants from the US, India, Australia, Thailand, Japan, the UK and other countries. Building on last years' success they have every indication that the discussions and exchanges at this years' event will be central in driving global academic and business collaboration.

The CAA 2016 conference will focus on technical innovations, market developments and commercial deployment of technologies focused on utilization of fly ash and bottom ash, boiler slag, flue gas desulfurization gypsum (FGD), and other flue gas materials captured by emissions controls.

More information is available at: <http://www.asiancoalah.org/caa-2016-introduction>

CRC-LCL

Annual Participants Forum 2015

The CRC for Low Carbon Living's Participants Annual forum was held 26th to 27th November, 2015 at the Australia Maritime Museum in Sydney. Celebrating the midpoint of the CRC planned seven (7) year research program, this conference-style event provided a platform to combine research, industry and government stakeholders with an interest in lowering carbon emissions of the built environment.

The program featured an inspiring line up of presentations, panel discussions and interactive sessions that included the Association CEO, Craig Heidrich. Discussions focused on the utilization of research for a low carbon built environment. This was supplemented by demonstrations about how the work of the CRC-LCL and its partners, can contribute to achieving the low carbon visions which are set by government.

The event covered a multitude of topics, for which the lecture slides have been made available online. A gallery of photos of the event are also uploaded on the CRC website, along with Student posters which were featured during the forum. Have a look at the CRC-LCL website to view numerous documents and resources with regards to their past, and ongoing projects here: <http://www.lowcarbonlivingcrc.com.au/resources/crc-publications/crc-lcl-presentations/participants-annual-forum-2015-crc-lcl-progress>

The building fabric represents around 15% of building lifecycle greenhouse gas emissions, and presents a significant opportunity for carbon reduction.

At the foundation of the low carbon built environment is an emerging breed of construction materials manufactured using techniques that minimise energy consumption and associated carbon emissions. By independently researching these 'low embedded carbon' materials and barriers to their uptake, we aspire to drive their adoption until they are a mainstream solution regularly specified by the construction industry.

Within impact Pathway 2 we are studying the design, durability and field performance of low embedded carbon construction materials such as geopolymer concrete to prove their commercial viability. By showcasing their application and developing new performance standards, we aim to drive market growth and uptake.

IMPACT PATHWAY 2: Lowering the embedded carbon in buildings projects funded by the CRC for Low Carbon Living and Ash Development Association of Australia totaling over \$3.5 million are:

Project 1

Steel reinforcement corrosion in geopolymer concrete (2013-2016) Researchers: Mahdi Babae (PhD candidate) and Arnaud Castel

Project 2

Durability of geopolymer concrete in Sulphate environments (2013 - 2016) Researchers: Supphatuch Ukritnukun (PhD candidate), Arnaud Castel and Chris Sorrel (Prof. Material Science UNSW)

Project 3

Carbonation and chloride diffusion in geopolymer concrete (2014-2017) Researchers: Amin Noushini (PhD candidate), Mohammad Khan (RA), Arnaud Castel and James Aldred

Project 4

Alkali Aggregate reaction in geopolymer concrete (2015-2018) Researchers: Dinesh Habaragamu Arachchige (PhD candidate), Mohammad Khan (RA), Arnaud Castel, Pre De Silva (ACU Sydney) and Vute Sirivivatnanon (Prof. UTS)

Project 5

Biogenic corrosion of geopolymer mortar (2015-2018) Researchers: Hammad Khan (PhD candidate), Mohammad Khan (RA), Arnaud Castel

Project 6

Using steel furnace slag aggregate in low calcium fly ash geopolymer concrete (2016-2019) Researchers: TBA (PhD candidate), Mohammad Khan (RA), Arnaud Castel, Steve Foster

Project 7

Field Testing of Geopolymer (Student: Kirubajiny, Swinburne)

Project 8

Geopolymer Truck Mix (Mithaq Kohees)

Project 9

Synthetic Aggregates Development from Fly Ash (Ahmed Graytee)

Project 10

Geopolymer Beam Tests (Chandani Tennakoon)

Contribute to CAM Testimonial



"For noting, I have just received a great email concerning my article for fly ash in agriculture. This was from a company in the United States asking for ongoing information about this work."



Thank you for the opportunity to submit articles, because they do get read and circulated internationally." – Jane Aiken

**SUBSCRIBE TO
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www.adaa.asn.au

