

OHE-CRETE SUSTAINABLE BUILDING MATERIALS

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UMTE 2020

PRODUCT BACKGROUND

Bamboo is abundant and widely distributed in Malaysia. It can produce a fiber with high strength to weight ratio and high tensile strength. Bamboo use reduced dependency on non-renewable fossil based resources. Bamboo is all year round resources, easily accessible and abundant.

PROBLEM

Concrete has a lower flexural, tensile and compressive strength.

SOLUTION

Reinforcement with steel or synthetic fiber, but they are not renewable, not biodegradable, friendly and costly to produce.

Bamboo fiber enhanced concrete strength up to 40%.

SOCIAL BENEFIT

Bamboo as the sustainable structural strengthening solution, to boost Malaysia's bamboo plantation and industry.

POTENTIAL APPLICATION

Plastic shrinkage and drying shrinkage control.

SPRC for thinner flat and curved structural element.

Ground slab & wall to improve strength and reduce thickness.

NOVELTY

Patent filing in progress, commercial demand is available.

Developed a high quality and innovative green composite in structural strengthening.

Transformed traditional application of bamboo towards a new modernized sustainable green strengthening solution.

PUBLICATIONS

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2. Baski S et al. (2019), *Materials Today Communications*, 23: 100676, W 3-8709.

3. Chen SC et al. (2019), *Key Engineering Materials*, 823: 465-473.

4. Chen SC et al. (2019), *Key Engineering Materials*, 823: 465-473.

5. Chen SC et al. (2019), *Key Engineering Materials*, 823: 465-473.

6. Tong PS et al. (2017), *Indian Journal of Science & Technology*, 10(2): 1-4.

7. Yan KP et al. (2016), *World Scientific Publishing*, Book chapter ISBN 978-981-5225-22-0.

COLLABORATION & INDUSTRIAL PARTNERS

2 MOAs with Edutopia Group Sdn Bhd

Project 1: RM46500 (UMC130701)

Project 2: RM42500 (UMC130701)

Application for building and communication tower

We acknowledge funding from Ministry of Education Malaysia through RAGS/17/2015/1001/UMEP/03/5 (RM0335400)

STATE OF THE ART

Organic fiber reinforcement

Chemical treatment

Reinforced concrete

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MARKET POTENTIAL

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BENEFIT OF PRODUCT

SUSTAINABLE & ENVIRONMENTAL FRIENDLY

REDUCED CARBON FOOTPRINT

IMPROVED DURABILITY

LOW COST & EASY TO APPLY

LOW CARBON & EASY TO APPLY

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[General](#)

Ir. Dr. Chin Siew Choo hasilkan bahan binaan lestari OHE-Crete

5 November 2020

Penyelidik dari Jabatan Kejuruteraan Awam, Kolej Kejuruteraan, Universiti Malaysia Pahang (UMP), Ir. Dr. Chin Siew Choo telah menghasilkan satu bahan binaan lestari iaitu OHE-Crete. Menurut anak kelahiran Negeri Sembilan ini, OHE- bermaksud hijau dalam bahasa Hawaii. "Oleh itu, OHE-Crete merujuk kepada konkrit hijau yang menggunakan serat (fiber) buluh untuk

menghasilkan produk bahan binaan yang lestari.

“Buluh digunakan sebagai bahan utama dalam kajian ini kerana dunia bergerak ke arah pembangunan menggunakan bahan hijau dan lestari malah buluh juga boleh digunakan sebagai alternatif kepada keluli kerana ia mempunyai kekuatan tegangan yang tinggi.

“Selain itu, buluh juga merupakan sumber yang murah berbanding keluli dan ia mudah didapati di seluruh Malaysia serta mudah ditanam secara tempatan,” ujar beliau.

Tambahnya, buluh dikatakan lebih ringan daripada keluli dan mempunyai nisbah kekuatan dan berat lebih besar daripada keluli.

“Pada dasarnya, konkrit mempunyai kekuatan lenturan dan tegangan yang rendah.

“Justeru, menerusi kajian ini, serat buluh dalam konkrit dapat meningkatkan kekuatan lenturan, dan kemuluran.

“Spesies buluh yang digunakan adalah buluh Semantan, Betung dan Beting yang mudah diperolehi di Malaysia, namun untuk penyelidikan ini buluh diperolehi dari Raub, Pahang” katanya.

Katanya, buluh ini dituai berdasarkan kepada usia matang mereka iaitu di antara tiga hingga lima tahun.

“Buluh itu kemudiannya akan melalui proses pengeringan dan rawatan kimia sebelum digunakan.

“Penyelidikan yang bermula sejak tahun 2015 ini telah melalui banyak fasa kajian. Ini termasuklah penilaian sifat fizikal dan mekanik serat, penilaian prestasi pelbagai spesies buluh dan komposit serta penggunaan buluh dalam pengukuhan struktur dan bahan konkrit.

“Idea kajian ini bermula semasa saya menyertai Pertandingan Citrex pada tahun 2014,” ujar beliau yang mempunyai kepakaran dalam bidang *Structures and Materials*.

Pada ketika itu, beliau membuat kajian pengukuhan struktur menggunakan serat sintetik yang diperbuat daripada gentian karbon.

Kajian itu hanyalah dari segi cara menggunakan produk itu secara lebih efektif dengan mengaplikasikan pada permukaan konkrit.

Jelasnya lagi, selepas menerima komen dari pengadil, beliau mula mendapat idea untuk mengkaji bahan hijau yang kuat dan mudah didapati yang boleh digunakan sebagai bahan untuk mengukuhkan struktur bangunan dan konkrit bagi menggantikan penggunaan gentian karbon sintetik yang bukan sahaja mahal malah berbahaya kepada alam sekitar serta kesihatan manusia.

“Serat buluh yang telah diproses itu dicampurkan di dalam konkrit bagi meningkatkan kekuatan lentur.

“OHE-Crete ini cepat dan mudah digunakan. Serat buluh ini hanya perlu dicampurkan bersama dengan bahan-bahan konkrit semasa proses penyediaan konkrit.

“Ia boleh digunakan pada jalan, tangga, teres dan lantai. Konkrit yang mengandungi gentian buluh ini boleh meningkatkan kekuatan konkrit sehingga 40 peratus.

Menurut Ir. Dr. Chin Siew Choo, matlamat penyelidikan ini ialah untuk menghasilkan bahan binaan yang mesra alam.

“Ia sesuai untuk digunakan dalam pembinaan struktur atau bangunan berkonsep hijau.

“Ini akan mewujudkan permintaan yang lebih tinggi terhadap produk buluh dan seterusnya mewujudkan usahawan buluh dari segi peniaga kecil dan sederhana serta sektor pertanian buluh.

“Secara amnya, produk penyelidikan ini mampu mengatasi masalah kelestarian projek pembinaan, di samping dapat membantu meningkatkan sosioekonomi masyarakat setempat.

“Penggunaan serat buluh bukan sahaja digunakan dalam konkrit malah digunakan sebagai gentian hijau komposit polimer menggantikan gentian karbon yang mahal dan memberi kesan buruk kepada persekitaran dan kesihatan umum,” katanya.

Di samping itu katanya, buluh juga merupakan penyelesaian kepada pengukuhan struktur yang mampan untuk meningkatkan industri perkebunan dan penanaman buluh di Malaysia.

Selain itu, ia turut memberi peluang pekerjaan kepada penduduk di luar bandar, khususnya orang asli yang lebih arif berkenaan buluh.

Kajian ini telah menerima geran daripada Kementerian Pengajian Tinggi Dana Pembudayaan Penyelidikan (RAGS) pada tahun 2015 bernilai RM 58,150 serta geran dalaman UMP.

Ir. Dr. Chin Siew Choo juga mempunyai MoA dengan Edotco Group Sdn. Bhd. dalam kajian buluh yang lain.

Ir. Dr. Chin Siew Choo memaklumkan bahawa projek penyelidikan ini juga pernah meraih pingat emas dalam Malaysian Technology Expo 2020 manakala dalam kategori Antarabangsa, kajian ini telah meraih 'Award of Merit' daripada Republic of Croatia dalam The Malaysia- Croatia Technology Expo Exchange 2020.

Disediakan Oleh: Hafizatulazlin Abdul Aziz dan Nur Hartini Mohd Hatta, Pejabat SUARA UMP

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