

AVoER 10

Riset dan Inovasi Teknologi
Dalam Menghadapi Tantangan
Era Revolusi Industri 4.0

Ruang Lingkup

Sains

Pangan

Teknologi

Lingkungan

Farmasi dan Kesehatan

Sosial Ekonomi & Humaniora

Keynote Speakers



Prof. Dwiwahju Sasongko, Ph.D.
Ketua Majelis Akreditasi BAN-PT
Guru Besar Teknik Kimia ITB



Prof. Dr. Ir. Rudy Setiabudy, DEA
Kaprodik Teknik Tenaga Listrik
Guru Besar Teknik Elektro UI



Prof. Dr. Ir. H. Hasan Basri
Guru Besar Teknik Mesin Unsri

Contact Person

Kotua

Prof. Dr. Ir. Eddy Ibrahim, MS - 0818633959

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Sie Makalah dan Editor

Dr. Saloma ST., MT - 08153852558

Sie Web dan Publikasi

M. Baitullah Al Amin, ST., M.Eng - 081368788186

Sekretariat & Kontak

Panitia Seminar Nasional

Penelitian dan Pengabdian Masyarakat AVoER ke-10
Unit Penelitian Pengabdian Masyarakat dan Kerjasama
Fakultas Teknik Universitas Sriwijaya
Jalan Sriwijaya Negara Bukit Besar - Palembang, 30192



avoer10@gmail.com



SEMINAR NASIONAL

Penelitian & Pengabdian Masyarakat

Call For Papers

Penerimaan Makalah : 20 Agustus - 25 September 2018
Pengumuman Makalah Diterima : 25 September - 05 Oktober 2018
Pengumpulan Makalah (Camera Ready) : 25 September - 10 Oktober 2018
Pelaksanaan Seminar : 31 Oktober 2018

Biaya Pendaftaran

PESERTA
Umum : Rp. 300.000
Mahasiswa : Rp. 200.000

PRESENTER/PEMAKALAH
Umum : Rp. 600.000
Dosen : Rp. 600.000
Mahasiswa : Rp. 300.000

Biaya Pendaftaran dapat dibayarkan melalui setoran ke
Bank BNI Cah. Palembang
Nomor Rekening : 0070570115
Nama Rekening : RPL 014 Unsri Penerimaan BLU

Catatan

Penyetoran dana lewat teller dengan penambahan berita pada saat transfer
FT AVoER REG ARDY untuk peserta

Lampirkan fotokopi/scan bukti setor registrasi/sponsor ke email panitia
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PANITIA SEMINAR NASIONAL
AVoER 10
FAK. TEKNIK - UNIVERSITAS SRIWIJAYA



No. : 008/AVoER10/FT/IX/2018

Palembang, 12 September 2018

Lampiran : 1 (satu) berkas
Perihal : Permintaan menjadi **Keynote Speaker** pada Seminar Nasional
AVoER-10 2018 Universitas Sriwijaya

Kepada Yth.
Prof. Dr. Ir. H. Hasan Basri
di- Tempat

Dengan hormat,

Schubungan akan diadakannya Seminar Nasional Penelitian dan Pengabdian Masyarakat, *Applicable Innovation of Engineering and Science Research* (AVoER) tahun ke-10 oleh Fakultas Teknik Universitas Sriwijaya, kami selaku panitia pelaksana berencana mengundang Bapak untuk menjadi keynote speaker pada seminar tersebut.

Kegiatan ini akan dilaksanakan pada :

Hari/Tanggal : Rabu/31 Oktober 2018
Waktu : 08.00 - selesai
Tempat : **Hotel Aryaduta Palembang**
Agenda : Seminar AVoER 10
Tema : Riset dan Inovasi Teknologi dalam Menghadapi Tantangan Era Revolusi Industri 4.0

Demikian surat permintaan dan undangan ini kami sampaikan, atas perhatian dan sambutan baiknya kami ucapkan terimakasih.

Mengetahui,
Dekan Fakultas Teknik Universitas Sriwijaya



Prof. Ir. Subriyer Nasir, M.S, Ph.D
NIP. 196009091987031004

Ketua Panitia
AVoER ke-10



Prof. Dr. Ir. Eddy Ibrahim, MS
NIP. 195805141984031001

PROSIDING

SEMINAR NASIONAL

PENELITIAN DAN PENGABDIAN KEPADA MASYARAKAT AVoER X
FAKULTAS TEKNIK UNIVERSITAS SRIWIJAYA



APPLICABLE INNOVATION OF ENGINEERING AND SCIENCE RESEARCH

"RISET DAN INOVASI TEKNOLOGI DALAM MENGHADAPI TANTANGAN ERA REVOLUSI INDUSTRI 4.0"

PENELITIAN

HOTEL ARYADUTA PALEMBANG

31 OKTOBER 2018

ISBN : 978-979-19072-3-1

Didukung Oleh :



INTERNASIONAL
PRIMA COI



KATA SAMBUTAN KETUA PANITIA AVoER 10 FAKULTAS TEKNIK UNIVERSITAS SRIWIJAYA



Assalamualaikum wr wb

Puji dan syukur kita panjatkan kehadiran Allah SWT karena berkat rahmat-Nya kita dapat menyelenggarakan kegiatan seminar nasional Penelitian dan Pengabdian kepada Masyarakat AVoER 10 ini.

Tema yang diangkat dalam seminar nasional ini adalah “**Riset dan Inovasi Teknologi dalam Menghadapi Tantangan Era Revolusi Industri 4.0**”. Latar belakang pemilihan tema tersebut terkait dengan semakin pesatnya perkembangan ilmu pengetahuan dan teknologi yang harus siap menghadapi tantangan di era Revolusi Industri 4.0 yang turut melahirkan perubahan dan pembaharuan di berbagai bidang kehidupan, terutama bidang sains, teknologi, pangan, ekonomi, sosial, humaniora, farmasi dan kesehatan.

Seminar ini memberikan kesempatan kepada semua pihak baik peneliti, akademisi, mahasiswa, praktisi dan pelaku industri untuk bertukar ide, pengetahuan dan perkembangan penelitian terbaru.

Untuk mendukung tema tersebut, kami mengundang empat pakar di bidangnya. Kami mengucapkan terimakasih kepada *keynote speakers*: Prof. Dwiwahju Sasongko, Ph.D, Prof. Dr. Ir. Rudy Setiabudy, DEA, Prof. Dr. Ir. Hasan Basri dan Daconi, S.T., M.M. yang bersedia hadir untuk menyampaikan dan membagikan paparan terkait dengan kesiapan riset dan inovasi teknologi pada era revolusi industri 4.0.

Seminar ini diikuti peneliti, akademisi, praktisi dan mahasiswa dari berbagai institusi. Ada 193 abstrak yang telah diterima untuk dipaparkan pada seminar kali ini yang merupakan hasil dari penelitian dan pengabdian pada masyarakat yang telah dilakukan oleh penulis.

Selain itu, seminar ini dapat terselenggara berkat bantuan berbagai pihak. Untuk itu, pada kesempatan ini izinkan kami mengucapkan terimakasih kepada Rektor Universitas Sriwijaya beserta jajarannya, Dekan Fakultas Teknik Universitas Sriwijaya beserta jajarannya, serta para sponsor yang telah berpartisipasi dalam kegiatan ini, serta pihak lain yang tidak bisa disebutkan satu persatu. Perhargaan yang setinggi-tingginya juga kami sampaikan kepada segenap panitia yang telah bekerja keras demi suksesnya kegiatan seminar ini.

Akhir kata, kami berharap kegiatan seminar ini memberikan manfaat bagi perkembangan ilmu pengetahuan dan teknologi.

Wassalamualaikum wr wb

Ketua Panitia AVoER ke-10
Fakultas Teknik Universitas Sriwijaya
Prof. Dr. Ir. Eddy Ibrahim, MS

KEYNOTE SPEAKER

Prof. Dwiwahju sasongko, Ph.D

Guru Besar Teknik Kimia Institut Teknologi Bandung dan Ketua Majelis Akreditasi BAN-PT



Prof. Rudy Setiabudy, DEA

Guru Besar Teknik Elektro Universitas Indonesia dan Ketua Konsentrasi Ilmu Tenaga Listrik UI



Prof. Dr. Ir. H. Hasan Basti

Guru Besar Teknik Mesin Universitas Sriwijaya



Daconi, S.T., M.M

Direktur Produksi dan Pengembangan PT. Semen Baturaja

Rundown Pelaksanaan Seminar Nasional PPM AVOER 10

Tanggal : 31 Oktober 2018
Waktu : 07.00 – Selesai
Tempat : Hotel Aryaduta Palembang

07.00 – 08.00 : Registrasi
08.00 – 08.05 : Menyanyikan Lagu Indonesia Raya
08.05 – 08.20 : Pembukaan tari tepak sirih
08.20 – 08.50 : Sambutan-sambutan dan Pembukaan Seminar

- Sambutan Ketua Panitia AvoER
- Sambutan Dekan FT
- Sambutan dan Pembukaan oleh Rektor UNSRI

08.50 – 09.05 : *Coffee Break*
09.05 - 10.25 : **Paparan Keynote Speech I, II, III, dan IV**
10.25 - 10.45 : Diskusi dan Tanya Jawab
11.00 – 12.00 : Sesi Paralel
12.00 – 13.00 : ISHOMA
13.00 – 16.36 : Sesi Paralel
16.36 – 17.00 : Penutupan

Keynote Speech :

- Prof. Dwiwahju Sasongko, Ph.D : Ketua Majelis Akreditasi BAN-PT, Guru Besar Teknik Kimia ITB
- Prof. Dr. Ir. Rudy Setiabudy, DEA : Ketua KI Tenaga Listrik, Guru Besar Teknik Elektro UI
- **Prof. Dr. Ir. Hasan Basri** : Guru Besar Teknik Mesin UNSRI
- Daconi, S.T., M.M. : Direktur Produksi dan Pengembangan PT. Semen Baturaja

SERTIFIKAT

Diberikan Kepada :

Prof. Dr. Ir. H. Hasan Basri

Atas Partisipasinya Sebagai

KEYNOTE

**Pada Seminar Nasional Penelitian dan Pengabdian Kepada Masyarakat AVoER 10
Yang Diselenggarakan Oleh Fakultas Teknik Universitas Sriwijaya
Palembang, 31 Oktober 2018**


Dekan Fakultas Teknik
Universitas Sriwijaya



Prof. Ir. Subriyer Nasir, M.S., P.hD
NIP. 196009091987031004

Ketua Seminar Nasional
AVoER 10

PANITIA SEMINAR NASIONAL
AVoER 10
FAK. TEKNIK - UNIVERSITAS SRIWIJAYA



Prof. Dr. Ir. Eddy Ibrahim, M.S
NIP. 196211221991021001

Diselenggarakan Oleh :



Didukung Oleh :



UNIVERSITY OF MECHANICAL ENGINEERING AND TECHNOLOGY

Symposium of Emerging Nuclear Technology and Engineering Novelty (SENTEN 2018)
 University of Sriwijaya & National Nuclear Energy Agency of Indonesia
 Palembang 4-8 July 2018

BIOMECHANICS IN MECHANICAL ENGINEERING PERSPECTIVE FOR THE FUTURE RESEARCH

by
Hasan Basri
 Department of Mechanical Engineering, University of Sriwijaya
 South Sumatera, Palembang, Indonesia
 Palembang, 01 July 2018

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Agenda

- History and Timeline
- World and Indonesia Demographic Trend
- Expenses for Health Devices
- Biomedical Engineering Development
 - Science and Technology Perspective
 - Business Perspective
- Biomechanics in Mechanical Engineering Research
 - Calcified Bone
 - Implants
 - Biomaterials

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History & Timeline

Great Minds of the Era
 980 - 1037 AD

Avicenna (980 - 1037 AD)

1200 - 1800 AD

1800 - Present

Great Minds of the Era
 1800 - Present

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Great Minds of the Era 1000 - 1300AD

Al-Tasif
 10th century specialist of medical practice

Al-Zahrawi (986 - 1037)
 "Father of Modern Surgery"

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Great Minds of the Era 1000 - 1300AD

Avicenna
 980-1037 AD

Avicenna (980 - 1037)

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Great Minds of the Era 1000 - 1300AD

Ibn al-Nafis (1213 - 1288)

Ibn al-Nafis (1213 - 1288)

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Great Minds of the Era 1000 – 1300AD

Ibn Sina
Philosophical Encyclopaedia

Ibn al-Baytar (1013 – 1038)

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The transition period 1300 – 1800AD

- Translation of Arabic and Greek scientific works into Latin.
- 1316 – Mondino de Luzzi: First systematic human dissections
- 1328 – Johannes Actuarius: the last great compendium of Byzantine medicine –
- 1500 – Antonio Vesalini: Pathological Anatomy
- 1556 – D. Shizheni: Compendium of Medical Materials
- 1726 – Claudius Aymard: performs the first successful appendectomy

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The Era of Medical Engineers

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The Era of Medical Engineers

1860 – Lindmark's pump (Wilhelm Lindmark)

1848 – First X-ray machine (Wilhelm Röntgen)

1871 – 1874 (Raymond Denonday)

1871 – 1874 (Raymond Denonday)

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The Era of Medical Engineers

Artificial Control Wrist

Low-Cost Ventilator (John Flanagan)

Hi-implant for the Hip (Timothy)

The "Iron Lung" (John Flanagan)

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INMOMENTS

7 BILLION

World Population

Year	Population (billions)
1950	2.5
2017	7.6
2030	8.4
2040	9.8
2100	11.2

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Growing population
 A rapidly increasing population in the Asia Pacific region has put an immense strain on infrastructure.

Projected population growth (2011-2050)

China: Population in 2050: 1.35B (2011: 1.35B)
 Japan: Population in 2050: 110M (2011: 128M)
 India: Population in 2050: 1.65B (2011: 1.1B)
 Southeast Asia: Population in 2050: 1.1B (2011: 600M)
 Indonesia: Population in 2050: 2.1B (2011: 230M)

Source: PwC Global Institute on Emerging Markets February 2017

Basic Need Have To Fulfilled

- Food
- Energy
- Water
- Social Welfare (Education and Health)

Proportion of Population Aged 65 Years and Over in South East Asia, 2011 and 2037

Country	2011 (%)	2037 (%)
Malaysia	5.0%	11.7%
Thailand	5.0%	11.7%
Philippines	4.8%	11.7%
Indonesia	4.8%	11.7%
Vietnam	4.8%	11.7%
Laos	4.8%	11.7%
Myanmar	4.8%	11.7%
Timor-Leste	4.8%	11.7%
Global average	8.0%	12.0%

- A rapidly increasing population in the Asia Pacific region has put an immense strain on infrastructure and demand for healthcare services in the South East Asia region due to the increase of population aged 60 years and over.
- In 2017, World Bank estimated that Indonesia will have 14 million people aged 65 and over.
- Health care will be the largest economic sector in support of an aging population, with a life expectancy of 76.9 in 2014, rising to an average 79.1 years in 2030.
- There will be the need for greater investment in healthcare infrastructure, which can be met through a stronger participation of the private sector and foreign investors in the healthcare services market.

Billion Dollar Industry

Meditech Market per Country

Country	Market Value (\$ Billion)
USA	4.0
China	2.0
Germany	1.0
France	0.8
UK	0.7
Japan	0.6
India	0.5
South Korea	0.4
Italy	0.3
Spain	0.2
Canada	0.1

Analysis

- Market of 6,200 billion covering a population of 6.2B million.
- Massive potential in South East Asia (2.1B) with total population of 6.2B million.
- SEA market significantly underdeveloped but expected to grow rapidly.

Expenses for Health Devices

- Average Annual National expenses: US\$ 1.7 T
- Role of National Industries to meet the expenses: 0.5% (US\$ 800 Million)
- 95% of health devices are imported from abroad.

Health Equipment Expenditure

- National needs of health equipment implant for health insurance implementation very high. High traffic accident numbers and increasing life expectancy in Indonesia, requires bone implant implants.
- Data Ministry of Health Republic of Indonesia In 2012 mentions total expenditure of health equipments RI reached approximately Rp 7 trillion. The majority of the Rp 8.74 trillion of health equipment expenditure comes from imports, the contribution of local manufacturing industry of health equipment only about 4%. In fact, the potential market of health equipment in Indonesia is quite large reaches 6% of GDP.

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Need and Market Opportunity on Medical Devices is Very High. In line With Population Growth, Divers of Disease and Welfare (GDP) Improvement

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**Technology Readiness Level (TRL):
Convert Scientific Research to Commercial Deployment**

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Technology Readiness Level (TRL): Fundamental Approach

- TRL 9: System ready for release into the operational environment
- TRL 8: Technology demonstration
- TRL 7: Demonstration of advanced system elements in a representative system
- TRL 6: System demonstration in a representative environment
- TRL 5: Demonstration of components in a representative environment
- TRL 4: Demonstration of components in a representative environment
- TRL 3: Demonstration of components in a representative environment
- TRL 2: Demonstration of components in a representative environment
- TRL 1: System research and development

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Adaptation Generic TRL to Specific TRL

Technology validated in relevant environment

Technology development scope

- Proof-of-Concept
- Validation
- System
- Technology Component

Definition of the environment in which the technology has been tested

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TECHNOLOGY READINESS

Technology Readiness Level (TRL): Medical device development

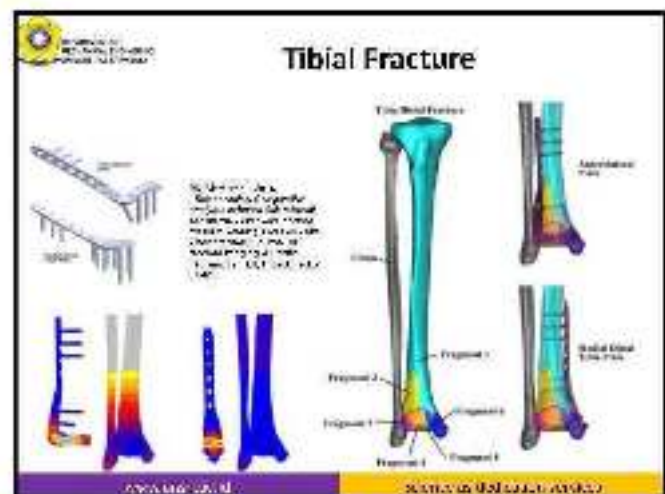
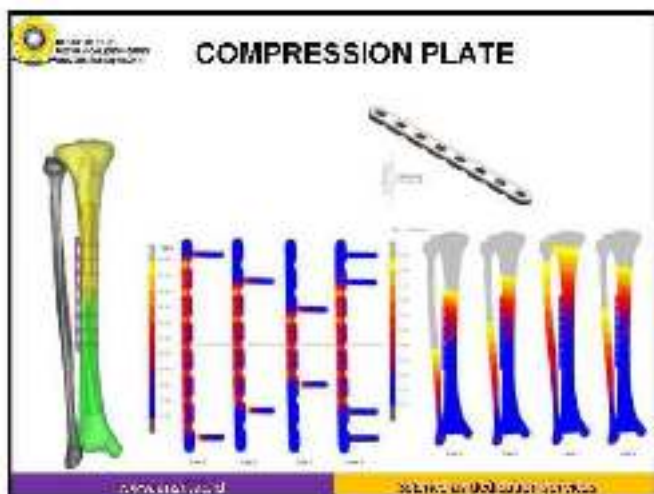
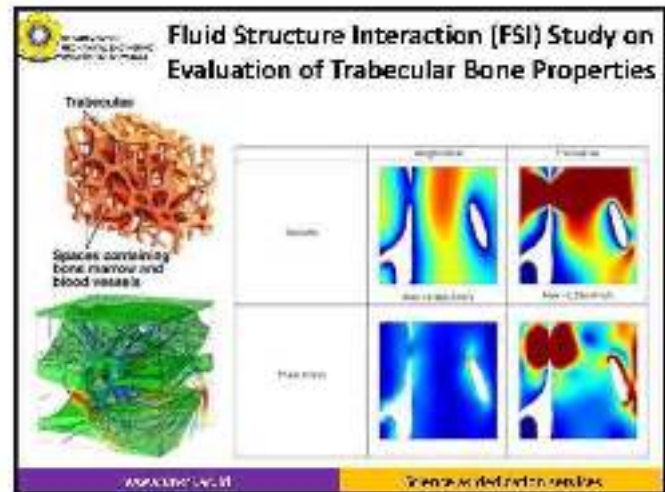
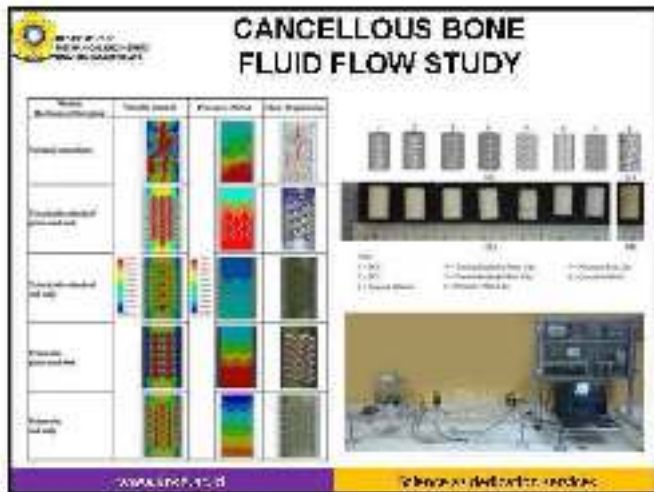
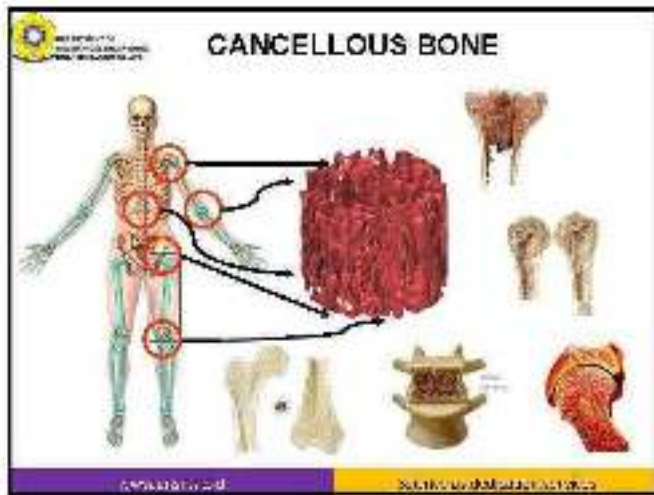
- TRL 9: Post-market surveillance surveillance
- TRL 8: Pre-clinical testing
- TRL 7: Design and development of the prototype in a representative environment
- TRL 6: Design and development of the prototype in a representative environment
- TRL 5: Development of the prototype in a representative environment
- TRL 4: Development of the prototype in a representative environment
- TRL 3: Development of the prototype in a representative environment
- TRL 2: Research and development in a representative environment
- TRL 1: System research and development

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TECHNOLOGY READINESS

Biomechanics

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DEGRADATION OF PURE MAGNESIUM WITH POREOUS STRUCTURE AS BONE SCAFFOLD

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Element	Spot 1	Spot 2
C	11.67	11.52
O	53.43	51.50
Mg	2.84	8.97
Si	32.22	35.91
Cl	1.84	0.70
Ca	1.12	0.67

Element	Spot 1	Spot 2
C	11.07	10.72
O	51.60	49.79
Mg	2.80	8.63
Si	11.14	11.67
Cl	0.46	0.74
Ca	0.62	1.18
Fe	0.72	0.11

Element	Spot 1	Spot 2
C	10.11	10.10
O	47.90	45.12
Mg	0.78	0.72
Si	11.17	12.04
Cl	1.10	1.46
Ca	10.50	14.20

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Collaboration Does Not Only Applied to Research

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