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Preface

Although in midst of Covid 19 pandemic conditions, this edition of Industrial Analysis Journal volume 14 no 3 December 2020 is still managed to publish. Thanks to continuous submission from contributors and hardwork of editor teams. This volume presents various fields of material sciences, process engineering, and transportation. Transportation engineering nowadays is among the priority programs in Indonesia, which emphasize in Infrastructures development. Material sciences are therefore very relevant in supporting this theme.

Research and studies were conducted by various institutions or individual researchers in those fields. In this edition, the journal publishes important and interesting papers about Instrumentation, such as Machine Learning Application In Response To Disaster Risk Reduction Of Forest And Peatland Fire Impact-Based Learning Of DRR For Forest, Land Fire, And Peat Smouldering; Anti-Vandalism System For Monitoring Smart Level Crossing Property: A Comprehensive Review and Mechanosynthesis Of MMC CuC Doped With Ti For Application Of Pantograph Contact Strip (PCS). Also research about construction is The Evaluation Of The Causes Of Retaining Wall Structure Failure At A River Based On SNI 2847:2013.

In this editions are published also paper on materials engineering : Deposition Ti-Sn On AISI 316L Substrate With Surface Mechanical Alloying Treatment (SMAT) For Biomaterial Application In Simulated Body Fluid and Implementation Of Root Cause Analysis Method To Investigate Failure Of Front Wall Tube Boiler. The other paper are environment researchers : The Potential Utilization Of Coffee Waste Into Bio-Briquette As Environmentally Friendly Fuel and Optimization Of Edible Film-Based Formula Of Corn Starch, Carrageenan, And Rice Bran For Hard Candy Packaging

The editors always do their best to improve the quality of the Journal; especially now that we are heading towards an english language journal in order to increase the impact and citations. The next publication is scheduled on April 2021. As closing remarks, the editors always call for critics and suggestions to further improve this Journal.

The Editors

Majalah Pengkajian Industri
(Journal of Industrial Technology Assessments)

MACHINE LEARNING APPLICATION IN RESPONSE TO DISASTER RISK REDUCTION OF FOREST AND PEATLAND FIRE
Impact-Based Learning of DRR for Forest, Land Fire, and Peat Smouldering

Hammam Riza, Eko Widi Santoso, Agus Kristijono, Dian Nuraini Melati, Firman Prawiradisastra

Abstract

Peat forest is a natural swamp ecosystem containing buried biomass from biomass deposits originating from past tropical swamp vegetation that has not been decomposed. Once it burns, smoldering peat fires consume huge biomass. Peat smoldering fires are challenging to extinguish. These will continuously occur for weeks to months. Experts and practitioners of peat smoldering fires are the most recommended effort to prevent them before they occur with the strategy: 'detect early, locate the fire, deliver the most appropriate technology.' Monitoring methods and early detection of forest and land fires or 'wildfire' have been highly developed and applied in Indonesia, for example, monitoring with hotspot data, FWI (Fire Weather Index), and FDRS (Fire Danger Rating System). These 'physical simulator' based methods have some weaknesses, and soon such methods will be replaced by the Machine Learning method as it is developing recently. What about the potential application of Machine Learning in the forest and land fires, particularly smoldering peat fires in Indonesia? This paper tries to answer this question. This paper recommends a conceptual design: impact-based Learning for Disaster Risk Reduction (DRR) of Forest, Land Fire, and Peat Smouldering.

Keywords: Artificial Intelligence; Machine Learning; Wildfire; Peat Smouldering; DRR impact-based

ANTI-VANDALISM SYSTEM FOR MONITORING SMART LEVEL CROSSING PROPERTY: A COMPREHENSIVE REVIEW

M. Rosyidi, Thiya Fiantika, Novi Irawati, Sinung Nugroho

Abstract

This research addresses the problem of vandalism incident related to the smart level crossing technology. Smart level crossing system is essential as a safety system inside the level area, because of that any failure related to the System will endanger the railway and road user. Another subsystem that protects smart level crossing property is critical. This research will show the plan for applying anti-vandalism technology and analysis another possibility of technology related to the System.

Keywords: Vandalism, Smart, Level crossing, Subsystem, Railway.

THE POTENTIAL UTILIZATION OF COFFEE WASTE INTO BIO-BRIQUETTE AS ENVIRONMENTALLY FRIENDLY FUEL

Joshua L.T., Sri Endah A.

Abstract

The coffee industry produces a large amount of waste in the form of coffee grounds, which is about 45% of the processed coffee beans. This research aims to study the potential of waste produced by the coffee industry as an environmentally friendly alternative fuel (green energy) in the form of biomass briquettes. The results show that coffee waste briquettes have a fairly good performance as fuel, are easily burnt, and have an energy content that is almost the same as dry wood. By using the "hot pressing" method in the mechanical pressing machine, bio briquettes with a fairly good density and strength level can be obtained. The briquettes have a heating value of 5169 – 5500 kcal/kg at water content of 12-12.5%, and a density of 0.35 – 0.86 g/cm3.

Keywords : Bio-briquettes; Biofuel; Used Coffee Grounds; Hot Pressing; Environmentally Friendly; Renewable Energy

OPTIMIZATION OF EDIBLE FILM-BASED FORMULA OF CORN STARCH, CARRAGEENAN, AND RICE BRAN FOR HARD CANDY PACKAGING

Heri Purwoto, **Ratih Dwi Ismawanti, Harianto, M.Jusuf Djafar, Widya Dwi Rukmi Putri, Erni Sofia Murtini**

Abstract

Plastic packaging has dominated the waste, and the number is increasing every year. Candy plastic packaging waste is most often considered trivial because of its small size, so it is usually disposed of carelessly. Due to its non-biodegradable, it causes environmental pollution. Edible film packaging is an alternative to reduce the impact of candy packaging waste pollution. The purpose of this study was to obtain the optimum formula of the edible film between corn starch, carrageenan, and rice bran as a hard candy packaging with the Response Surface Methodology (RSM) Central Surface Composite Design using the Design Expert 10.0.7. The prediction data obtained is then verified and tested by t-test at a 5% reliance interval.The optimum formulation of RSM results is 3.4% of corn starch, 1.1% of carrageenan and 0.38% of rice bran with predicted response of water content of 14.51%, WVTR 61,06 g/m^2/hour, viscosity of 258.8 cP, tensile strength of 107.9 kgf/cm^2, elongation of 19.41%, and modulus of response young 586.28 kgf/cm^2. The verification of the optimum formula had a moisture content of 14.37%, WVTR 63.34 g/m^2/hour, viscosity of 244.9 cP, tensile strength of 96.9 kgf/cm^2, elongation of 20.96%, and young modulus of 462.49 kgf/cm^2.

Key Words : Corn starch; Carrageenan; Rice bran; Formula optimization; Edible film; Hard candy

DEPOSITION Ti-Sn ON AISI 316L SUBSTRATE WITH SURFACE MECHANICAL ALLOYING TREATMENT (SMAT) FOR BIOMATERIAL APPLICATION IN SIMULATED BODY FLUID

Febriyanto Wijaya Pangestu, Talitha Ratna D, Djoko Hadi Prajitno

Abstract

The properties of biomaterials such as biocompatibility, which is non-allergic and non-toxic to be the main requirements that must be owned by the biomaterials because of the presence of direct contact between the biomaterial with body parts. Therefore the study of biomaterials is constantly carried to repair the biocompatibility. In this research, the improvement of the properties the compatibility of the metal alloy AISI 316L with superimposed ideal bio-inert Ti-Sn with the method of Surface Mechanical Alloying Treatment. Manufacture of the alloy with bio-inert Ti-Sn using a variation of the composition of Sn of 10% and Sn 20% done using Mechanosynthesis process. The results of the process are sintered with the variation of temperature of 800^{o}C and 900^{o}C for 2 hours and then were characterized by an optical microscope. Corrosion testing of the alloy was carried out with Polarization Tafel System Three Electrode method for 10 minutes. The results of characterization with an optical microscope shows there is a layer of bio-inert Ti-Sn the results of the process of SMAT of AISI 316L. The results of corrosion testing on alloy AISI 316L Ti-Sn in a solution of SBF showed that the content of Ti-10%Sn with a temperature of 800^{o}C the obtained corrosion rate 4.785 MPY and at 900^{o}C amounted to 4.155 MPY as well as on the content of Ti-20%Sn with a temperature of 800^{o}C the obtained corrosion rate 3.525 MPY and at 900^{o}C amounted to 3.234 MPY.

Keywords : Biocompatible; Biomaterial; AISI 316L; Ti-Sn; Corrosion Rate; Allergic Reaction; Deposition.

MECHANOSYNTHESIS OF MMC CuC DOPED WITH Ti FOR APPLICATION OF PANTOGRAPH CONTACT STRIP (PCS)

Andhika Abdan Rahmanullah, Pawawoi, Djoko Hadi Prajitno

Abstract

This research was conducted to determine the effect of the addition of Titanium (Ti) and the sintering temperature variation on MMC CuC alloys as reinforcing elements. The process of this research uses powder metallurgical method with an alloying technique in Mechanical Alloying using a Planetary Ball Mill (PBM) machine with a speed of 600 rpm for 2 hours, the ratio of powder to the ball mill is 10:1. The compacting process is carried out using dies 11 mm in diameter and compacting pressure of 90 Kg/cm^2. The sintering process is carried out three times, with variations in sintering of 800^{o}C, 900^{o}C, and 1000^{o}C with sintering time for 1 hour in the tube furnace in the argon gas vacuum environment. The number of samples used in this study amounted to 9 samples with variations in alloy and temperature sintering, consist of MMC CuC alloy with addition of Ti 0%, 0.5%, 1.5% (T=800 ^{o}C), MMC CuC with addition of Ti 0%, 0.5%, 1.5% (T=900 ^{o}C), and MMC CuC with addition of Ti 0%, 0.5%, 1.5% (T=1000 ^{o}C). The tests included Vickers hardness testing, metallography testing, XRD testing, and SEM-EDS testing. The addition of Ti elements and varying sintering temperature had an effect on the hardness value of MMC CuC material with the highest hardness value in samples with 1.5% Ti alloy (800oC) which is 87.25 HV, and the lowest porosity value is 2.491% in the sample of 1.5% Ti (1000^{o}C).

Keywords : MMC CuC; Mechanical Alloying; Titanium; Pantograph Contact Strip

IMPLEMENTATION OF ROOT CAUSE ANALYSIS METHOD TO INVESTIGATE FAILURE OF FRONT WALL TUBE BOILER

Eka Febriyanti, Amin Suhadi, Laili Novita Sari

Abstract

Root cause analysis is a method that observes all of the possible causes that make the system or components fail. This research is implemented such a method to investigate the failed front wall tube on the boiler. The purpose of this research is to find out the main cause of failure on the front wall tube to avoid a similar problem in the future. Considering all aspects that have the potential to be the main cause of failure, therefore, many tests and examinations are done, including visual tests, fractography, metallography, chemical analysis, hardness test, SEM, and EDS analysis. Examination result on the fracture surface shows two bulges on a tube and some longitudinal cracks spread on bulges outside the surface area. At the same time, the thick scale is also found on the inside surface of these bulges. Moreover, microstructure and hardness changes are also found in this area. From the analysis of all test result that obtained it is concluded that the main cause of failure is the presence of scales which reduce heat transfer so that local overheating occurred. Consequently, its tensile strength in this area is decreased, and finally, the tube could not support operational pressure and deformed to make a bulge.

Keywords: Root cause; Failure; Front wall; Tube; Boiler

THE EVALUATION OF THE CAUSES OF RETAINING WALL STRUCTURE FAILURE AT A RIVER BASED ON SNI 2847:2013

Tri Handayani, Sudarmadi

Abstract

In this paper, the application of SNI 2847:2013 in the evaluation of the case of a retaining wall failure is presented. The method is the analytical retaining wall evaluation, which consisted of visual inspection in the field, depth measurement of pile and sheet pile, and the quality test of concrete material. The data were used as input in structure modeling using Finite Element Method (FEM) software to calculate each structural member's required strength (R_u). The calculation was done to obtain the design strength ($ØR_n$) of the structural member. The retaining wall is considered safe if its design strength is greater than or equal to the required strength or $ØR_n \geq R_u$. If this condition cannot be fulfilled, the retaining wall is considered failed, and then the causes of failure would be performed. The result showed that the depth of the pile and sheet pile is less than the required minimum depth, and concrete quality is below the specification mentioned in the as-built drawing data. According to structural analysis and calculation of site investigation data, it could be known that the causes of retaining wall failure are the design strength is smaller than the required strength and the vertical moment due to its self-weight is much smaller than the horizontal moment due to soil and water pressure, so it causes the structural sliding.

Keywords : Retaining Wall Failure; Retaining Wall Evaluation; Required, Strength; Design Strength; Sliding