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The National Seminar on Chemistry (SNK 2018) aimed to improve the quality of research in Chemistry and Chemical Education through implementation the higher order thinking skills and science literacy. The Conference was held in Surabaya, Indonesia on September 22nd, 2018. The Conference was hosted by the Chemistry Department , Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya, Indonesia

Please click here for the conference website.

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The National Seminar on Chemistry 2018 (SNK 2018) was dedicated to the topic “Higher Order Thinking Skills and Chemical Literacy as Support for Quality of Research in Chemistry and Chemical Education”. This conference was motivated by a variety of Indonesian natural resources, abundant, and demanding the development of innovation through material engineering producing the high quality materials known as smart materials. The conference took place in Surabaya, September 22nd, 2018. The success of this conference is supported by 90 presenters and more than 160 participants.

This conference had qualified keynote speakers namely Dr. Akhmad Sabarudin, S.Si., M.Sc., from Brawijaya University, Dr. Sukro Muhab, M.Si.,

from Universitas Negeri Jakarta, and Prof. Dr. Titik Taufiqurohmah, M.Si., from Universitas Negeri Surabaya. They are experts in the field of molecular and material science, higher order thinking skills and science literacy, and nanomaterial science, respectively. The articles in this conference included the areas of Energy and Renewable Energy, Materials Chemistry, Computational Chemistry, Natural Product Chemistry, Synthesis of Organic Chemistry, Cosmetical Chemistry, Analytical Chemistry, Environmental Chemistry, Biochemistry, and Chemical Education. All the qualified papers had been selected through a strict reviewed process for Atlantis Press proceeding.

We would like to express our gratitude to keynote speakers, invited speakers, presenters, participants, organizing committee, members of scientific committee, reviewers, and sponsors for supporting the conference, Special thanks to Mr. Zeger Karssen from Atlantis Press for his support in publishing the proceedings.

Dr. Achmad Lutfi, M.Pd.
Chairman of Organizing Committee

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Organic Polymer Monolith: Synthesis and Applications For bioanalytical

Ahmad Sabarudin

High-speed separation, enrichment, digestion, as well as high-throughput analysis of biomolecules are very important in analytical and bioanalytical chemistry, biosciences, etc. for thesepurposes, currently a single piece of porous material so-called "monolith", Has been rapidly developed for Several...

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High Order Thinking Skills in Chemical Research to Develop Entrepreneurship and Campus Economic Power

Titik Taufikurohmah

Higher-level thinking skills in determining the topic and direction of policy is very important research related to the comprehensive benefit as a result of a study. The study is expected to provide comprehensive solution of social problems of his day so the presence of the results of research studies...

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Profile of The Indonesian Essential Oil from Melaleuca cajuputi

Sutrisno Sutrisno, Rini Retnosari, Henie Poerwandar Asmaningrum

The chemical composition of three cajuput essential oils of Melaleuca cajuputi (M. cajuputi) from different area in Indonesia were analyzed using gas chromatography–mass spectrometry to determine the similarities and differences among their volatile chemical compositions. These cajuput oils

come from...

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Degradation of Chicken Feathers by Indigenous Pseudomonas aeruginosa

Suharti Suharti Suharti, Laila Badriyah, Hizkia Putraasa

Our effort in discovering new valuable organism, A newly bacterium was isolated from chicken feathers enriched soil. Microscopic and biochemical study as well as 16S rRNA gene analysis identified the bacterium as Pseuodomonas aeruginosa. Microbial growth study confirmed its capability to use chicken...

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Analysis of the Clinical Volunteer Complaint Relation with Dangerous Substances in Cosmetic Formula Used)

Titik Taufikurohmah, Siti Tjahjani, I Gusti Made Sanjaya, Andika Pramudya Wardana, Hans Lumintang, Tjandrakira Tjandrakira, Afaf Baktir, Achmad Syahrani, Adi Soeprijanto

Dangerous substances in cosmetics have been widely known especially mercury face whitening. Socialization of the impact has also been made by NA-DFC (The National Agency of Drug and Food Control. However, the circulation of cosmetics contain contains mercury still exist on the community society. It needs...

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Glycerin Purification of Biodiesel Production Side Products by Distillation Method

Mohammad Istnaeny Hudha, Dimas Indra Laksmana

Limited reserves of fossil fuels in the world, encouraging each country, the search for alternative energy sources is more urgent. One alternative to renewable energy is biodiesel produced from vegetable oil. Biodiesel is generally produced from the transesterification process of vegetable oils (triglycerides)...

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Study of Packaging Variations on the Quality of Instant Tomato Powder Drinks

Faidliyah Nilna Minah, Siswi Astuti

Instant drinks are already a major requirement to fulfill human consumption in the era of globalization. According to the national health department, more than 5% of Indonesians consume instant drinks from various types. This figure is an opportunity for us to conduct research that produces quality drinks...

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Utilization Activated Carbon from Bagasse in Processed of Laundry Waste

Dwi Putri Handayani, Nining Fitriana, Rusmini Rusmini

Research was carried out on the use of activated carbon from bagasse for processing laundry waste. The method used is the adsorption method with a variation of the length of contact between activated carbon and laundry waste. Laundry waste parameters analyzed included MBAS, phosphate, COD, BOD, TSS and...

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The Development of New Composite Polymer Membrane : Polysulfone (PSf)/polyetherimide (PEI) coated membrane

Pirim Setiarso, Nita Kusumawati, Agus Budi Santoso, Setya Chendra Wibawa

In this research, the effect of coating composition (polyetherimide (PEI)) on the physical and mechanical characteristics as well as pure water flux (PWF) of the PSf/PEI composite membranes. The physical characteristics of membranes were analyzed based on the acquisition of surface and cross section...

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Extraction and Characterization of The Base Halal Gelatin

Based on Bovine Bone

Asrul Bahar, Rusijono Rusijono, Nita Kusumawati

In this study bovine bone material was cured with alkaline solution (calcium oxide) for 10, 30 and 50 days and extracted at three temperature levels (60 °C in extraction I, 70 °C in extraction II, and 100 °C in extraction III) each for 4, 5 and 6 hours. The results showed an increase in the percentage...

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Development of Textile Natural Dyeing using Hybrid Dyes from Mango Leaves Turmeric

Nita Kusumawati, Samik Samik, Agus Budi Santoso, Asri Wijiastuti

In this study, natural staining procedures have been evaluated using hybrid dyes of mango and turmeric leaves. To get rich color shades with high strength and color fastness, coloring is done by involving a number of preparation stages which include washing using Turkish Red Oil (TRO), mordanting using...

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The Prouction and Characterization of Kaempferia Galanga L. –Based Herb Powder: Blanching and Drying Procedure Influence on Proximate, Metal, and Microbial Contamination

Pirim Setiarso, Rusijono Rusijono, Samik Samik, Nita Kususmawati

This research was conducted to obtain the procedure for the production of

herb powder based on Indonesian local Kaempferia galanga commodities which have proximate as well as metals and microbes contamination level that meet the requirements in the Indonesian National Standard (SNI) 01-3709-1995. Blanching...

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Toxicity Test Toward Dichloromethane Fraction from White Frangipani Leaves (Plumeria alba)

Nurul Hidajati, Qodriyah Qodriyah

White frangipani (Plumeria alba) is a plan that is widely grown in Indonesia especially in Java and Bali. It has been conducted a research to know the chemical content of the plan leaf. The leaves of plant are extracted with dichloromethane solvent and then separated by using chromatographic techniques...

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Toxicity Assay of Phenolic Compound Isolated from the Dichloromethane Extract of Silver Fern (Pityrogramma calomelanos)

Najihah Najihah, Suyatno Sutoyo, Ismono Ismono

Pityrogramma calomelanos is fern in the Polipodiaceae family that grows in tropical Asia including Indonesia. This research aims to determine the molecular structure of phenolic compound isolated from the dichloromethane extract of the silver fern's aerial part and toxicity activity test. The

extraction,...

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Synthesis of Hydroxyapatite from Crab Shell (Scylla serrata) Waste With Different Methods Added Phosphate

Sari Cahyaningrum, Nuniek Herdyastuty, Fenty Wiana, Bella Devina, Dicky Supangat

Hydroxyapatite (HAp) is the main material of bone structure which has chemical formula Ca10(PO4)6(OH)2. In this research, HAp synthesis use precursor calcium from crab shells and phosphate from H3PO4. Phosphate addition is done in single drop and wise drop. The calcinations of crab shell were done at...

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Usage Of Chitosan-Silica with Crosslinking Agent As A Matrix For Slow Release Fertilizer

Raisza Savana, Dina Kartika Maharani

Research with the title of the use of silica chitosan with glutaraldehyde crosslinking agents as a matrix in the making of slow release urea fertilizer has been done. The purpose of this research was to determine the physical and chemical properties of slow release fertilizer coated with chitosan-silica...

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Isolation and Cytotoxicity Test of Dichloromethane Extract of Syzygium malaccense

Novirlin Daely, Tukiran Tukiran

Syzygium malaccense or also known as Malay Apple is one of Myrtaceous plants. It is originally found in India and Malaysia. This plant has strong potential which can be traditional medicine. In the present study, it has been done an isolation the chemical components from dichloromethane extract of the...

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Cytotoxicity Test of Isolated Compound from Syzygium malaccense Stem Bark on Fibroblast BHK 21 Cells

Mahdania Ratri Paramitha, Tukiran Tukiran

Medicinal plants are one of the traditional medicines that are now often used by the community. One plant that can be used as a medicinal plant is guava (Syzygium malaccense). The plant is a Syzygium genus that grows a lot in Java. Several studies have shown that stem bark of the plant contain sapiens,...

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Phytochemical Properties of Skin Care Cream Containing Essential Oil of Galangal

I Gusti Made Sanjaya, Ismono Ismono, Titik Taufikurohmah, Andika Pramudya Wardana

A research has been conducted on development and physicochemical characterization of skin care cream containing essential oils of galangal. The skin care cream containing essential oils of galangal developed consists of a red galangal cream that utilizes the essential oil ingredients extracted from red...

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Immunostimulant Activity of Flavonoid Isolated from The Acetone Extract of Silver Fern (Pityrogramma calomelanos)

Suyatno Sutoyo, Ismono Ismono, Mitarlis Mitarlis

A flavonoid compound namely kaemferol had been separated from the

acetone extract of the silver fern (Pityrogramma calomelanos). It was obtained as yellow needles crystal with m.p. of 271-273 oC. Determination of its structure was conducted by the spectroscopic method and by comparison with reported...

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Chromium in Fermented Rice Flour with Bakery's Yeast

Rudiana Agustini, Filla Qodaria N, I Gusti Made Sanjaya

Research is conducted to determine the chromium content in rice flour which is fermented with bakery's yeast. The procedure involves several steps including sample preparation, fermentation, making crude bromelain enzymes, making YHE (Yeast Hydrolysate Enzymatic), and determining the chromium content....

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The Potential of Yacon Root (Smalanthus sonchifolius (Poepp.et Endl.) H.Robinson) as Prebiotics to Stimulate Growth of Lactobacillus plantarum B1765

Prima Retno Wikandari, Ega Rocky Rafsanjani, Kharisma Nur Puspitasari

Yacon (Smalanthus sonchifolius Poep p. Endl.) root is a source of inulin and fructooligosacharide (FOS) which potent as a prebiotic. Inulin and FOS hydrolyzed to glucose and fructans by inulinase which is secreted by probiotics bacteria and further metabolized to short chain fatty acids (SCFA) that were...

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Synthesis and Characterization of Electrolyte Membrane Based Biopolymer Chitosan and Fly Ash Combinations for Fuel Cell Application

Gugus Handika, Achmad Ilham Ghozali, Bias Hilal Saga, Mochammad Purwanto

A composite membrane biopolymer chitosan filled fly ash was fabricated as alternative membrane electrolyte for fuel cell application. The membrane was synthesized from chitosan from deacetylation of shrimp shells and then cross-linked with sulfonic acid network by introducing fly ash. The aim was to...

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Mechanical Properties Characterization of The Biodegradable Plastic Made from Composite of HDPE (High Density Polyethylene) and Gembolo (Dioscorea bulbifera L.) Starch

Yolanda Harnike Putri Wardani, Suyatno Sutoyo

It had been conducted research on characterization the mechanical properties of biodegradable plastic composites from HDPE (High Density Polyethylene) and gembolo starch. This study aims to determine the mechanical characteristics of biodegradable plastic made from a mixture of HDPE and gembolo starch....

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Steroid Isolated from the Dichlorometane Extract of Matoa's Stem Bark (Pometia pinnata) and Toxicity Tests Against Artemia salina Leach

Dian Rohmawati, Suyatno Sutoyo

This study is conducted to determine a steroid compound from the dichloromethane extract of matoa's stem bark (Pometia pinnata) and toxicity assay against Artemia salina Leach. In this reseacrh, extraction was carried out by maceration, separation by chromatography, purification by recrystallization,...

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Synthesizing Graphene Oxide as a Working Electrode Using Cyclic Voltammetry

Aldwin Amireza, Setiarso Setiarso

This research has been done by synthesizing graphene oxide as a working electrode using Hummer method. Aim of this study is comparing capability of electron transfer within electrode. This can be done with using composition of working electrode by mixing synthesized product and organic glue paraffin,...

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Characteristics Of Adhesive Firmness Of Tannin Resorcinol Formaldehyde From Johar Sawdust Extract As Adhesive On Lamina Wood

Agestya Hernawati, Suyatno Sutoyo

This research has been done by testing the adhesive firmness of resorcinol formaldehyde from Johar sawdust extract. This study aims to determine the best adhesive characteristic made of the mixture of Johar sawdust extract with resorcinol and copolymerized with formaldehyde. The composition comparison...

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The Influence of PDEODE Learning Model and 5M Scientific with High Order Thinking Skills against Students Chemical Literacy

Sukro Sukro, Rika Afritasari

The purpose of this research are to know the influence of learning models (PDEODE and 5M) and critical thinking skills on students' chemical literacy. The population of the research were students of State Senior High School 5 Jakarta. The research instrument used are critical thinking test and chemical...

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Implementation Problem-Based Learning Model to Enhance Self-Regulated Learning on Material of Colloidal System

Ferdianti Fidya Aprillia, Utiya Azizah

This study aims to describe the learning process and the students' self-regulated learning through the implementation of the problem-based learning model. The obtained data were analyzed using quantitative descriptive approach. Results showed that: (1) The implementation of problem-based learning model...

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Scientific Literacy Skill Of Junior High School Student Using Ethnoscience Based Learning

Nindy Silvia Melyasari, Suyatno Sutoyo, Wahono Widodo

The challenge of education in Indonesia today is to guide students into a literate generation, a generation that is sensitive and concerned about the environment and issues that are happening. To be a human who has good information literacy, all we needs to be done is reading habits. Permendikbud No...

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Design and Validation of Teaching Instruments Oriented Problem Solving to Train Students' Metacognitive Skills

Dian Avina Turja Soffa, Sri Poedjiastoeti, Pirim Setoarso

This research aims to develop a valid teaching instrument. The developed teaching instruments oriented problem solving to train students' metacognitive skills at acid base titration topic. The specifications of instruments included the syllabus, lesson plans, student worksheets, and tests. The problem-solving...

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Innovation of Chemical Learning through The Application of Chemical Supplement Book Based on Asmat Tribe Papua Local Wisdom

Henie Poerwandar Asmaningrum, Okto Irianto, Yus Witdarko

This research is a classroom action research that aims to improve the learning outcomes of chemistry of the eleventh grade students of SMA Negeri 1 Tanah Miring and SMK Negeri 1 Tanah Miring on the of colloid topic through the application of chemical supplement books based on Asmat Tribe's local wisdom....

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The Validity of Teaching Materials used Guided Inquiry Model Integrated with STEM to Train Student's Critical Thinking Skills On Thermochemistry Topic

Sophia Allamin, Suyatno Sutoyo, Utiyah Azizah

this research aims to produce a valid teaching material. The developed

teaching materials used inquiry learning model integrated with STEM to trill students' critical thinking skills on Thermochemistry topic. The specifications of product included the syllabus, lesson plan, Student Worksheet, Student...

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The Effect of Problem Based Learning Model by Animation Media on Student Learning Outcomes in Senior High School on Chemical Bonding Top

Faderina Komisia, Maria Aloisia Uron Leba

The purpose of this research are (1) to know the differences of students learning outcome who are taught using problem based learning model with animation media with problem based learning model without animation media and conventional learning on chemical bonding topic (2) to know the differences of...

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Development of Student Worksheet Based Guided Inquiry to Practice Scientific Literacy in Thermochemical Chapter of XI Grade in Senior High School

Filayati Ma'ruf Nur, Rusly Hidayah

The purpose of this study is development the Student Worksheet based on theoretical and empirical feasibility. The theoretical feasibility of the Student

Worksheet is based on the feasibility of the content, language, presentation and graphics. The empirical feasibility of the Student Worksheet is reviewed...

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Shifting Patterns of Pre-Service Teachers' Conceptions on Material of Colligative Properties of Solutions

Harun Nasrudin, Utiya Azizah

This study aims to describe the shifting patterns of pre-service teachers' conceptions on the material of colligative properties of solutions. The occurred misconceptions were then overcome using metacognitive learning strategy. The pre-service teachers' conception status was determined by the results...

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The Use of interactive multimedia in balancing redox reactions for facilitating learning style differences

Sukarmin Sukarmin, Suyono Suyono

This study aims to determine, students' learning styles, the improvement of learning outcomes, and student responses to interactive multimedia. The Interactive multimedia "ChemTutor" in balancing redox reactions to be applied in research class. The results of this research showed that from 15 students...

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Alternative Lesson Design of Basic Chemistry Learning to Integrate Green Chemistry Principles as View of Scientific Character Values

Mitarlis Mitarlis, Utiya Azizah, Bertha Yonata

This Actual global problem in this time is decreasing of environment quality. Some effort had been done to solve this problem as well as through education by designing lesson as an alternative to implement green chemistry principles. The aims of this study that discussed in this article were; 1) analyze...

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Application Sorogan-Bandongan Model in Lectures Reaction Mechanism

Rinaningsih Rinaningsih, Suyatno Sutoyo, Asep Kadarohman, Harry Firman

Sorogan-Bandongan is an integrated lecture model coming from the traditional learning that are implemented at Islamic boarding school in Indonesia. It starts with Sorogan and ends with Bandogan. The implementation of integrated lecture model of Sorogan-Bandongan with stages of students reading and doing...

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Development of Student Activity Sheet Scientific Literacy Oriented in Acid-Base Matter

Pipit Soleka Listyaningrum, Bertha Yonata

The aims of the research is to describe the feasibility of student worksheet science literacy oriented in acid-base matter assessed from criteria the validity, practicality, and effectiveness. The type of research uses 4D development method that limited until development stage (Develop). The instrument...

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Development Of The Adventure Of Element Based On Role Playing Game As A Learning Media On Element Chemistry Matter

Aprianto Aprianto, Achmad Lutfi

The aim's of this research was to develop The Adventure of Element based on Role Playing Game as a learning media on element chemistry matter. The feasibility of a game that developed assessed from criteria the validity, practicality, and effectiveness. This research used Research and development (R&D)...

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Development of Virtual Laboratory Inorganic Chemistry of Main Elements Based on Blended Learning Using Pogil Strategy

Kusumawati Dwiningsih, Sukarmin Sukarmin, Muchlis Muchlis, Dina Kartika Maharani

This research has the objective to determine the feasibility of virtual laboratory-based blended learning developed in the materials of inorganic chemistry of main group elements in terms of the validity of the quality of the content and purpose, construct, instructional, and technical. The type of...

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The Development of Learning Model of Map Concept with Inquiry Strategy

Ismono Ismono, Sri Poedjiastoeti, Suyatno Suyoto

Higher order thinking skills (HOTs) are needed by the students of chemistry education, because they will become teachers who will be teach HOTs for students. This research is research and development. this study has the aim to examine the feasibility of developing concept map learning models with inquiry...

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Developing Student Worksheet Oriented to Science Literacy in Chemical Bonding Matter to Train Student's Science Literacy

Ability in Senior High School

Puput Fuzi Adytia, Kusumawati Dwiningsih

This study aims to describe the validity and practicality of developed scientific literacy worksheets. The validity of worksheets is reviewed based on contents and concepts, while the practicality of the worksheet is reviewed based on student responses supported by observations of student activities. This...

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Training Multiple Intelligences (Visual-spatial and Linguistic Intelligence) of Students Through Guided Inquiry Model Lesson on Reaction Rate Chapter

Muhammad Andi Tanri Prasetyo, Dian Novita

This study aims to describe the learning outcomes of multiple intelligences (visual-spatial and linguistic intelligence) of students who are raised with inquiry learning model that is guided on the reaction rate material at SMAN 1 Krian Sidoarjo. This type of research is pre-experimental with One group...

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The Validity Of The Guided Inquiry Learning Model Tool to Train Students' Scientific Literacy Skills

Riza Dwi Puspitasari, Sri Poedjiastoeti, Pirim Setiarso

This study aims to produce learning tools that are feasible to be used in the

learning process. Learning tools developed are oriented towards guided inquiry models that aim to train students' scientific literacy skills. Learning tools consist of syllabus, lesson plans, student worksheets, and assessment...

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Effectivity of Interactive Multimedia and Student Activity Sheets with Writing-To-Learn (WTL) Strategy in Science Learning for Hearing Impairment Students

Sukarmin Sukarmin, Sri Poedjiastoeti, Dian Novita, Achmad Lutfi

This study aims to describe the implementation of interactive multimedia and student activity sheets with writing-to-learn (WTL) strategy for hearing impairment students in chemistry subjects in the household. Multimedia interactive were implemented to 9 students Jember Senior high School of hearing...

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Development Of Anti Miskim Software To Reduce Misconception With Conceptual Change Text Strategy Students Of Class X In Chemical Bonding Material

Galuh Eka Wulandari, Sukarmin Sukarmin, Rusly Hidayah

This study aims to determine the feasibility of developing Anti Miskim software to reduce misconceptions of students of class X in chemical bonding material. This type of research is a development research that develop Anti

Miskim software on chemical bonding material and research design used is R &...

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Development Of Wind's Maze Chemistry Game Based On Android As A Learning Media On Hydrocarbon Matter For Eleventh Grade Senior High School

Winda Dwi Fitria, Achmad Lutfi

This study aims to obtain a game of Wind's Maze Chemistry based on android which is suitable to be used as learning media on main Hydrocarbon subject for eleventh grade of Senior High School's based on the validity, practicality, and effectiveness of the game. The type of this study uses research and...

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How are students' ability and perception in using media through synthesis organic chemistry learning?

Lusia Lusia Narsia Amsad, Liliasari S, Asep Kadarohman, Sardjono R E

Lecturer usually uses media in order to help students' understanding about organic chemistry. In this research, the aim is to find out the ability and perception of students in learning by using media in the form of online and offline. The offline media we used was namely Spartan Student V6, and ChemAxon...

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Build Ecopreneurship College Student Through Design Game As Learning Media of Chemistry On Media Lecture Game of Chemistry

Achmad Lutfi, Rusly Hidayah, Dian Novita

This research aim for measured success train ecopreneurship college student through design game as a learning medium chemistry on game media course chemistry. On media courses game of chemistry, college student divided in groups given task project for compile plan ICT game as a learning media of chemistry....

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Improving students' HOTS through the disconnection stages of learning synthesis organic compounds

Liliasari Liliasari, Lusia Narsia Amsad, Asep Kadarohman, Ratnaningsih Ratnaningsih E. Sardjono

Learning synthetic organic chemistry has several stages of the learning material that should be followed by students. One of the importance stages in learning organic synthesis is the disconnection stages. This study aims to be able to find out the improvement of students'HOTS through learning stages...

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Misconception Analysis Based On Students Mental Model In Atom Structure Materials

Abdul Majid, Suyono Suyono

One of the causes of misconception in chemical studies is mental models. Mental models are students' initial abilities which consist of perception, understanding discourse, and imagination ability. This study aims: (1) to determine the level of student understanding in understanding the concept of atomic...

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Chromium in Fermented Rice Flour with Bakery's Yeast

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***Abstract*—Research is conducted to determine the chromium content in rice flour which is fermented with bakery's yeast. The procedure involves several steps including sample preparation, fermentation, making crude bromelain enzymes, making YHE (Yeast Hydrolysate Enzymatic), and determining the chromium content. In this study, measurements were taken on several parameters which included measurement of chromium (III) and chromium (VI) measured by a voltammeter instrument. The results showed that Yeast - black rice had the highest chromium (III) content of 112 x 10^{-4}%. Likewise, the chromium (VI) content from YHE - black rice was also the highest compared to YHE - white rice and YHE - red rice, which amounted to 53 x 10^{-4}%.**

Keywords—YHE *(Yeast Hydrolysate Enzimatic)*, chromium, bakery's yeast

I. INTRODUCTION

Chromium is a type of body mineral that is used in small amounts to maintain normal body functions. It is needed by our body in the metabolism of fats and carbohydrates [1] [2]. Chromium is suspected in the body can affect the behavior of the hormone insulin, a hormone that plays a role in regulating blood sugar levels.

Chromium is found widely in environments such as air, water, soil, plants and animals. Chromium can be obtained by consuming several types of food. Foods that contain chromium are grain breads, cereals, lean meats, organ meats, cheeses, mushrooms, asparagus, green beans, potatoes, prunes, bananas and nuts.

Chromium has several functions and benefits, one of which is to help metabolize carbohydrates. In addition, this type of mineral also functions to monitor blood sugar levels and help stabilize blood sugar. Chromium mineral sources that are quite good are found in *Saccharomyces cerevisiae*, a microorganism classified as khamir. This khamir is one of them found in bakery's yeast or also called bread yeast.

Saccharomyces cerevisiae includes khamir from the Ascomycetes class which contains lots of protein, carbohydrates and fats, so that it can be consumed by humans and animals to supplement their daily nutritional needs. *Saccharomyces cerevisiae* is very easily grown on a variety of media provided there are sources of carbon, nitrogen, hydrogen, oxygen, sulfur, calcium, vitamins, minerals and water [3] [4]. The growth of *Saccharomyces cerevisiae* can be influenced by several factors, one of which is fermentation media. The media used must be able to meet the requirements of containing simple carbohydrates. One of the fermentation media that can be used for *Saccharomyces cerevisiae* is flour which contains mainly starch [5], such as rice and wheat. Some types of rice that are generally available are brown rice, black rice and white rice.

Saccharomyces cerevisiae which is successfully grown can be further processed, which is extracted through an enzymatic hydrolysis process to produce a product known as YHE (Yeast Hydrolisate Enzimatic). Yeast extract is used in the food industry as a flavoring agent for soups, snacks, substitutes for MSG (Monosodium Glutamate), canned foods, plant nutrients, and supplements in health foods. In health food supplements, the content used is chromium. Chromium content in yeast in 1 oz (28.35 grams) is 3.3 µg [6].

This study is conducted to determine the chromium content in rice flour fermented with bakery's yeast and then enzymatically hydrolyzed to produce YHE (yeast hydrolysate enzymatic).

II. RESEARCH MATERIALS AND PROCEDURES

A. Sample Preparation

Flour as a fermentation medium such as red, white and black rice flour is dried and mashed or blended. Flour is then filtered by passing the 100 mesh sieve.

B. Fermentation Stage

As many as 25 grams (in dry weight) of each black, red, and white rice flours are included in different fermenters. Each rice flours is added with 250 ml of boiling distilled water and stirred until the gel is formed. Combine 5 grams of amylase and beta glucoamylase enzymes. The mixture was incubated for 48 hours at 37°C. The incubated mixture is then added 10 grams of bread yeast and anaerobically fermented for 36 hours at room temperature.

C. Stage of Making Crude Bromelain Enzyme

Ten green pineapples were prepared with the pineapple's eye removed, then cut and mashed until smooth with a blender and added with a little distilled water. The crushed pineapple is filtered with a clean cloth. The filtered pineapple results are centrifuged 1500 rpm for 10 minutes. The resulting filtrate was added with 35-40% ammonium sulfate and stirred slowly using a magnetic stirrer in cold conditions

for 45 minutes and allowed to stand for 24 hours in the refrigerator. The mixture was centrifuged at a speed of 6000 rpm for 25 minutes to take the supernatant.

D. Stage of Making YHE

The fermentation results were carried out by plasmolysis stage by adding 35% NaCl for 48 hours. The mixture is then centrifuged at a speed of 1500 rpm for 10 minutes. Yeast fermented from a variety of rice flour produced in the form of pellets is then collected as a fermented solid paste. Fermented solid paste is then added 50 ml of pineapple crude and enzymatic hydrolyzed for 48 hours at temperature 30ºC.

E. Determination of Chromium (III) and Chromium (VI) Content

Preparation of standard chromium solution was carried out by weighing 0.512481 grams of $CrCl_3.6H_2O$ for Cr^{3+} and 0.283 grams of $K_2Cr_2O_7$ for Cr^{6+}, then each dissolved in 1000 mL of distilled water to produce each 1000 ppm concentration of mother liquor. Each one hundred milliliters of the two mother liquor solutions were taken and then each diluted with distilled water at a concentration of 5,10,20,40, and 80 ppm. Sample preparation was carried out by weighing each of five grams of sample, namely YHE from red rice flour, white rice flour, and black rice flour and then each of them was put into a dry porcelain crust and the weight was already known. The samples are then put into a furnace at a temperature of 500ºC for 4 hours. Each porcelain crust was taken and weighed the end result. Each porcelain crust was dissolved using 1 mL concentrated HCl and 1 mL concentrated HNO_3. The mixture was allowed to stand for 24 hours. Each porcelain crucible was dissolved with aquademin to a volume of 25 mL and then taken 10 mL of sample in each dissolved porcelain crucible, and added 5 mL of citrate buffer pH 3 for Cr^{3+}, and citrate buffer pH 4 for Cr^{6+} and also added 10 mL 0.1 N KCl. Each sample was tested for its chromium content using a voltammetry instrument. The obtained voltammogram is then analyzed using the origin pro7.0 application to determine the levels of Cr^{3+} and Cr^{6+}.

III. RESULT AND DISCUSSION

A. Determination of Chromium (III)

Table I shows the results of current strength measurements for standard Cr (III) solutions of various concentrations.

TABLE I. CR (III) STANDARD SOLUTION VOLTAMMOGRAM

Concentration (%)	Ipc (A)
5 x 10^{-4}	3.386295E8
1 x 10^{-3}	3.412831E8
2 x 10^{-3}	3.4521E8
4 x 10^{-3}	3.57035E8
8 x 10^{-3}	3.711003E8

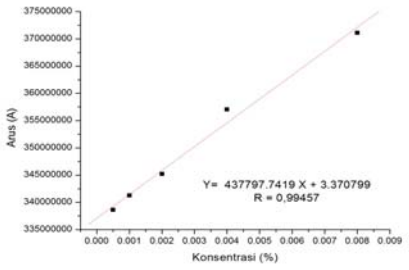

Fig 1. Cr (III) Standard Solution Calibration Curve

The results of concentration mapping on the current strength of the standard solution Cr (III) produces the line equation Y = 437797,7922 x + 3,370798. Substituting the results of current strength measurements from each sample of white rice, brown rice, black rice, white rice yeast (yeast-BP), red rice yeast (yeast-BM), black rice yeast (yeast-BH), YHE white rice (YHE-BP), YHE red rice (YHE-BM), and YHE black rice (YHE-BH) into equation Y = 437797,7922 x + 3,370798 it can produce Cr (III) concentration from each of these ingredients. Table 2 shows the results of the measurement of Cr (III) of each ingredient, namely. white rice, brown rice, black rice, white rice yeast, red rice yeast, black rice yeast, white rice YHE, red rice YHE, and black rice YHE.

Table II shows that Cr (III) content increased in white rice yeast, red rice yeast, and black rice yeast after fermentation with an increase of 81%, 18%, and 92%, respectively. This increase is likely due to the addition of bakery's yeast. The increase in Chrom (III) content also occurred in white rice YHE, red rice YHE, and black rice YHE compared to white rice, brown rice and white rice with a consecutive increase of 12%, 18%, and 20%. The results of this study also showed that after the yeast enzymatic hydrolysis process into YHE there was a decrease in Cr (III) content in white rice YHE, brown rice YHE, and black rice YHE respectively 69%, 66%, and 72%. This is likely one of the causes is that there is Cr (III) which is released during the centrifuge.

TABLE II. RESULTS OF CR (III) MEASUREMENT

Sample	Cr (III) content (%)	Increase of %Cr (III) (from flour to yeast)	Decrease of %Cr (III) (from yeast to YHE)
white rice	20 x 10^{-4}		
red rice	19 x 10^{-4}		
black rice	20 x 10^{-4}		
yeast-white rice	101 x 10^{-4}	81	
yeast-red rice	103 x 10^{-4}	84	
yeast-black rice	112 x 10^{-4}	92	
YHE-white rice	32 x 10^{-4}	12	69
YHE-red rice	37 x 10^{-4}	18	66
YHE-black rice	40 x 10^{-4}	20	72

B. Determination of Chromium (VI)

Table 3 shows the results of the standard curve voltammogram obtained from the current with respect to concentration.

TABLE III. RESULTS OF CR (III) MEASUREMENT

Concentration (%)	Ipc (A)
5 x 10^{-4}	3.179479E8
1 x 10^{-3}	3.206797E8
2 x 10^{-3}	3.319159E8
4 x 10^{-3}	3.513842E8
8 x 10^{-3}	3.817654E8

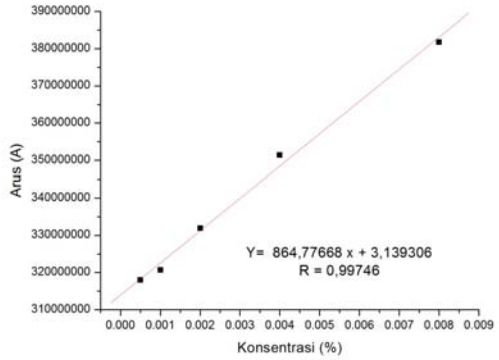

Fig 2. Cr (VI) Standard Solution Calibration Curve

Mapping of the concentration on the current strength of the standard solution Cr (VI) produces the line equation Y = 864,77668 x + 3,139305. Substituting the results of current strength measurements from each sample of white rice, brown rice, black rice, white rice yeast, red rice yeast, black rice yeast, white rice YHE, red rice YHE, and black rice YHE into the equation Y = 864, 77668 x + 3,139305, the concentration of Cr (VI) from the material can be known. Table 4 shows the results of measurements of Cr (VI) from each ingredient of white rice, brown rice, black rice, white rice yeast, red rice yeast, black rice yeast, YHE white rice, YHE brown rice, and YHE black rice.

bakery's yeast. Bakery yeast is known to be rich in chromium. The increase also occurred in YHE white rice, YHE red rice, and YHE black rice compared to white rice, brown rice and black rice with a 6%, 8% and 10% increase respectively. The results also showed that after the enzymatic yeast hydrolysis process to YHE there was a decrease in the content of Cr (VI) in YHE - white rice, YHE- red rice, and YHE - black rice with a decrease of 34%, 32% and 34% respectively. This may be one of the causes is that there is cr^{6+} which is released when the centrifuge.

In YHE-black rice, Cr (VI) content decreased from 53 x 10^{-4}% to 19 x 10^{-4}%. In YHE-black rice, Cr (VI) content decreased from 49 x 10^{-4} % to 17 x 10^{-4} %. Whereas in YHE-white rice, the content of Cr (VI) decreased from 48 x 10^{-4}% to 15 x 10^{-4}%. This indicates that yeast - red rice and yeast - black rice has the ability to bind Cr (VI) greater than yeast - white rice.

IV. CONCLUSION

Based on the data analysis, it can be concluded that the highest chromium (III) content are yeast - black rice products at 112 x 10^{-4}%. The highest chromium (VI) content is yeast - black rice products by 53 x 10^{-4}%.

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