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## Research papers

- ES110201 Using the reactive inkjet printing technique to fabricate the gas sensors on textile substrates 43-48

Z. Stempien, M. Kozicki, M. Kozanecki, R. Pawlak, E. Korzeniewska, G. Owczarek, A. Poscik

**Abstract:** This work describes the fabrication of printed gas sensors on textile substrates by using the reactive inkjet printing technique. Polyaniline (PANI), polypyrrole (PPy) and reduced graphene oxide (rGO) based gas sensing layers were printed on top of gold electrodes which were vacuum deposited on polypropylene textile non-woven fabric. The sensing properties such as sensing response and recovery times were studied for different gases. The fabricated sensors showed a relevant changes in relative resistance after exposing to tested gases and they can be considered for use in smart clothing for personal monitoring of industrial spaces for various hazardous gases.

- ES110202 Study on Corrosion behaviour of carbide composite prepared by stir casting and squeeze casting techniques. 49-56

Rajendra Prasad A , Bhaskar G.B, Vasudevan N, Suresh S.M

**Abstract:** Metal Matrix Composites (MMCs) are most sought engineering materials due to its excellent adaptability for a wide span of applications which requires high specific strength with good corrosion resistance. The quality of composites produced has close relation with the processing techniques. As the stir casting and squeeze casting techniques are the widely used techniques for producing Metal Matrix Composites (MMCs), an attempt has been made to study the corrosion behavior of MMCs produced by those techniques. The present study incorporates the comparative study of processing techniques and its relation with corrosion behavior, the aluminium alloy AA5083 was carefully selected as matrix material considering its good corrosion resistance, super plasticity, high strength and weld ability. In metal matrix to enhance the mechanical properties of aluminium alloy such as specific strength, stiffness, hardness, adhesive, abrasive and thermal properties the ceramic particles of Silicon carbide (SiC) (2 % & 4%) were added. The microstructural characterization was investigated for the composite using standard metallurgical preparation and imaging methods. The salt spray test study has been conducted to evaluate the corrosion resistance of the aluminium alloy 5083 based composites prepared by stir casting and squeeze casting techniques. The test result shown that the corrosion resistance of the composite is decreased due to increasing content of SiC particles. It was also well observed in microstructure that the high compaction experienced by the composite during squeeze casting technique led to distorted ceramic particle which in turn increases corrosion.

ES110203            Bias test applied to silicon coated and uncoated Polyamide 6.6 fabrics            57-62

Mihaela Oleksik and Valentin Oleksik

**Abstract:** This article proposes an experimental study regarding the mechanical behaviour of the composite materials having a Polyamide 6.6 fabric (also known under the “nylon” commercial name) as stand and the influence of the material which is impregnated with (silicone in most cases) on the mechanical properties of these materials. These composite materials are the most often used materials for vehicles’ airbags manufacturing. In this paper are presented the results of the Bias test applied to coated and uncoated polyamide 6.6 fabrics. The Bias test implies the applying of a tensile load on a test sample whose length is twice as large as the width, in which the fibers are oriented at an angle of 45° towards the testing direction.

ES110204            Role of Ethylene Vinyl Acetate (EVA) on anti-bacterial activities            63-68

of Polyethylene doped with biocides

Apisit Kositchaiyong

**Abstract:** Anti-bacterial performances of Polyethylene (PE) doped with biocide were studied for the effect of Ethylene Vinyl Acetate (EVA) addition. Commercial biocides available in the market, namely, Zeomic, a silver-base inorganic antimicrobial agent, and Hybricide-94, a Zinc-complex antimicrobial agent, were adopted by being introduced into PE along with necessary additives at different dosages ranging from 0.5 – 10% wt. Accelerated weathering test (Q- UV aging) was also studied in accompanying with the effect of EVA addition. Percentage bacteria reduction following JIS Z2801 and bacteria cell adhesion (or bio-fouling) tests against gram negative bacteria of *Vibrio parahaemolyticus* were used for evaluating anti-bacteria activities of materials. The results found that anti-bacteria activity of PEs doped with Hybricide-94 was very much higher than those doped with Zeomic. Added EVA/PE blend doped with biocide had pronounced anti-bacteria effect after Q-UV aging. This implied that EVA could act as a role of control releaser of biocide embedded in PE for long-term uses.

ES110205            Non-uniformity of the radon indoor concentration under convective diffusion            69-74

J. Atabayev, N. Ibrayev, D. Sharipova, S. Spotar

**Abstract:** This paper focuses on the results of CFD modeling of radon concentration distribution in living areas within residences. COMSOL Multiphysics® 5.3 software package has been employed for solving coupled momentum and species transport problems together with pseudo-reaction term modeling the radon radioactive decay process. The reliability and verification of the simulation model was tested by comparing with available experimental data. The obtained results show the existence of stagnant zones where the concentration of radon is substantially higher than the average values. The impact of factors such as wind velocity, air tightness and incoming radon flux were taken into consideration.

Byounghee Kim, Baejin Kim, Sinwoo Song, Kyoungdyuk Rho, Jonghyo Lee

**Abstract:** This paper presents a semigroup based neural network architecture for improving prognostic capability which is one of the Condition Based Maintenance (CBM) methodology. Many approaches to support the CBM process exist, whose applicability is highly dependent on lots of constraints. The purpose of the paper is to propose the new method of extrapolation which can be a base to a CBM so that user can act in advance. The target of this investigation will be the prediction (by way of extrapolation) of the transient heat transfer which is one of the main factor of system failure. Given a set of empirical data with no analytic expression, we first develop an analytic model and then extend that model along an extrapolation axis. The concept of proposed neural networks will be applied to develop an intelligent monitoring system for other engineering problem.