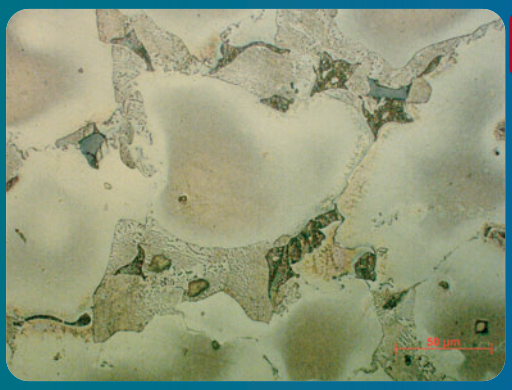
Contents

Materials

Properties

Selected materialographical photo

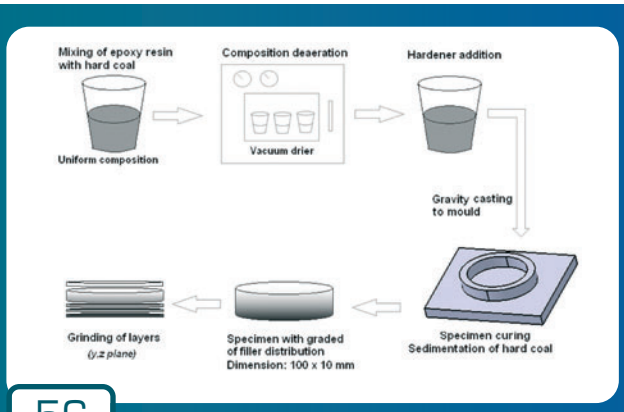


64

The paper from Methodology of research area made by T. Tański, L.A. Dobrzański, and R. Maniara on "Microstructures of Mg-Al-Zn and Al–Si–Cu cast alloys" on a **page 64** presents the structure of the MCMgAl6Zn1 magnesium and ACAlSi9Cu aluminium cast alloy in as-cast state. The following results concern the microstructure of the cast magnesium and aluminium alloys using ZEISS SUPRA 25, Opton DSM-940 scanning and LEICA MEF4A light microscopy, X-ray qualitative microanalysis as well as X-ray analysis. The analysis of the structure magnesium alloy consists of the solid solution α – Mg (matrix) of the secondary phase γ – $Mg_{17}Al_{12}$ evenly located in the structure. The structure creates agglomerates in the form of needle precipitations, partially coherent with the matrix placed mostly at the grain boundaries. The AC AlSi9Cu and AC AlSi9Cu4 cast aluminium alloys are characterised by a dendritic structure of the α solid solution - as the alloy matrix, as well are characterised by a discontinuous β–Si phase forming the $\alpha+\beta$ eutectic grains, with a morphology depending on the silicon and copper mass concentration. Taking into account the fact that some of the properties are of great importance only for the surface of the material, the future investigation will concern modelling of the alloy surface using surface layers deposition methods like physical vapour deposition methods. A desire to create as light vehicle constructions as possible and connected low fuel consumption have made it possible to make use of magnesium and aluminium alloys as constructional material in automotive industry.

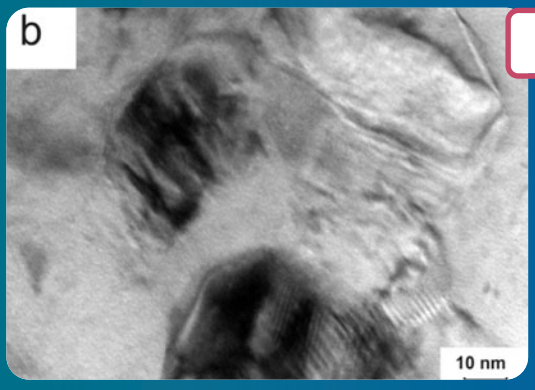
33

The research paper entitled "Mechanical behaviour characterising and simulation of polyacrylate rubber" by D. dos Santos and G.F. Batalha on a **page 33** presents the influence of EB radiation on the mechanical behaviour of UV curing polyacrylate rubber (ACM) and to simulate its behaviour. In most cases the experimental results showed an increase in the strength at rupture and a decrease in the elongation at the rupture with increasing of radiation dose. Equibiaxial and planar shear tests presented similar behaviour like uniaxial results, in terms of elongation decrease and strength increase, with some deviations. Ogden's Model third order provided simulated curves with similar behaviour in comparison to experimental curves. The infrared spectroscopy showed different chemical group contents in the analyzed regions, surface and middle region. Usually EB radiation has been used to modify polymeric structure and to improve thermal and mechanical polymers behaviour. Regarding as rubber materials EB is usually applied as an alternative form of vulcanisation. UV is a new type of curing for polyacrylate rubbers, which are usually cured by thermal processes. Improved behaviour of UV curing ACM can extend the range of industrial applications, or improve its performance in known applications.



56

The paper from Properties area made by J. Stabik, M. Szczepanik, A. Dybowska and Ł. Suchoń on "Electrical properties of polymeric gradient materials based on epoxy resin filled with hard coal" on a **page 56** describe functionally the gradient polymeric materials and technology of the gradient production. The experimental part describes preparation of circular disc samples of polymeric gradient material by gravity casting method. Finally electrical surface resistance and surface resistivity was measured and analysed. The experimental results demonstrated that addition of conductive filler (hard coal) to epoxy resin caused a change of surface resistivity of these materials. Hard coal together with epoxy resin formed gradient composite material with different filler content in subsequent layers. This paper is original because in the research programme electrical properties of a new type of polymeric gradient composites were tested and presented in it.



95

In the paper entitled "The Cr_3C_2 thermal spray coating on Al-Si substrate" by M. Richert, M. Książek, B. Leszczyńska-Madej, I. Nejman, R. Grzelka and P. Pałka on a **page 95** the changes between the plasma sprayed and high velocity oxy-fuel (HVOF) wear Cr_3C_2 resistant coats has been presented. The differences in microstructure and microhardness of coatings were investigated. The characterisation of fully melted, un-melted and partly melted areas was performed. The investigated coats contained very differentiate areas, especially plasma sprayed layers. Systematic investigations of microstructure by using optical, electron scanning microscopy and transmission electron microscopy selected fully melted, un-melted or partly melted areas and their characteristic features were performed. Microhardness of coats was measured and compared with the similar literature results. Microstructure of plasma sprayed coats was finding as consisting from elongating splats, additionally contained un-melted previous particle of powder and some voids and oxides. Contrary to this the HFOV coatings were more uniform containing almost equiaxial grains. The microhardness of HFOV coatings was almost two times higher than plasma sprayed ones. It was assumed that HVOF coatings have more uniform microstructure, higher microhardness, which could suggest better resistance before the wear and grindability.

Methodology of research

Analysis and modelling

Manufacturing and processing