



Materials

7. Investigation of the Portevin-Le Chatelier effect by the acoustic emission

B. Grzegorzczak, W. Ozgowicz,  
E. Kalinowska-Ozgowicz, A. Kowalski (Poland)

15. Microstructure investigations of cast Zn-Al alloys

B. Krupińska, Z. Rdzawski, M. Krupiński,  
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Properties

23. Evaluation of selected properties of PA6-copper/graphite composite

J. Konieczny, B. Chmielnicki, A. Tomiczek (Poland)

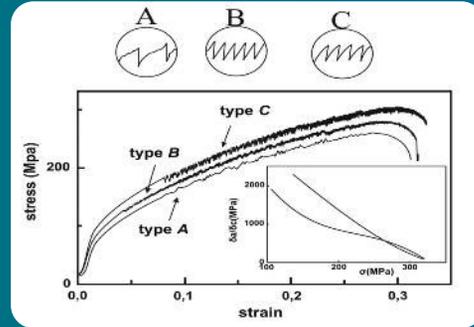


Methodology of research

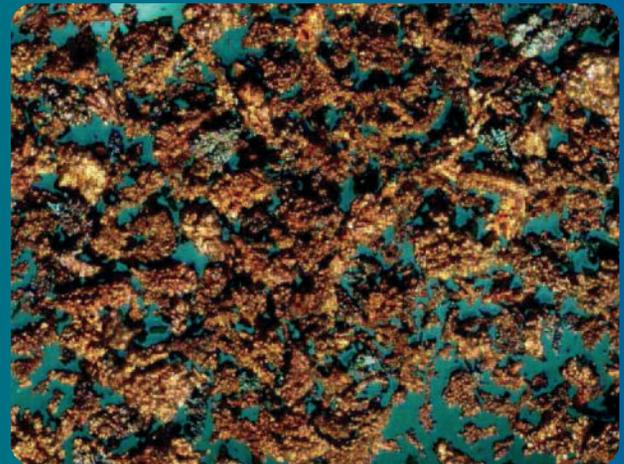
31. Metallographic investigations of metal plate edges after cutting

D. Gąsiorzek, A. Mężyk, A. Skibniewski,  
W. Głuchowski (Poland)

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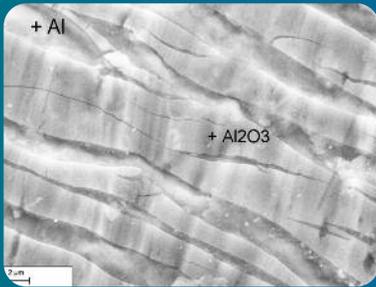


The Materials section represented by B. Grzegorzczak, W. Ozgowicz, E. Kalinowska-Ozgowicz and A. Kowalski on "Investigation of the Portevin – Le Chatelier effect by the acoustic emission" on a **page 7** describes the relation existing between the behaviour of the signals of acoustic emissions generated in the course of plastic deformation at elevated temperature, and the shape of the work-hardening curves  $\sigma$ - $\epsilon$  and the Portevin – Le Chatelier effect. Single crystal was investigated applying the method of free compression at a constant strain rate and a temperature within the range from 20°C to 400°C at a strain rate of  $10^{-5}$  sec<sup>-1</sup> to  $10^1$  sec<sup>-1</sup>, simultaneously recording this phenomenon by means of acoustic emission. The analysis of the results of these investigations permitted to prove considerable relations between the work-hardening curve  $\sigma$ - $\epsilon$  displaying the PLC effect and the characteristics of the signals of the acoustic emission generated in the uniaxial compression. The AE method applied in the process of plastic deformation of single crystals of the alloy CuZn30 displays also a dependence of the activity of acoustic emissions on the stage of strain-hardening of the investigated alloy. In the range of the occurrence of the PLC effect during the compression test of the investigated single crystals the signal AE displays a cyclic character, distinctly correlated qualitatively with the oscillations of stresses on the curve  $\sigma$ - $\epsilon$ .



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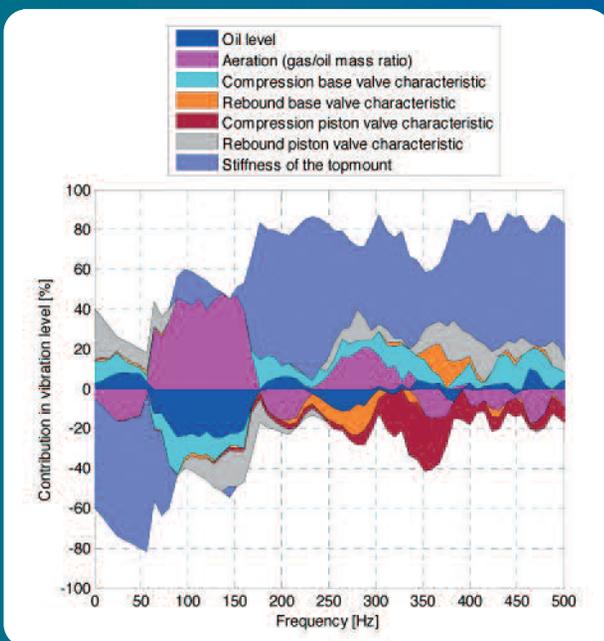
The paper entitled "Evaluation of selected properties of PA6-copper/graphite composite" by J. Konieczny, B. Chmielnicki and A. Tomiczek on a **page 23** demonstrates the possibility of improving the tribological properties and thermal conductivity of composites with structural modification of polyamides by the additions of copper and graphite. The study involved testing polyamide composites containing metallic powder. As the matrix was used polyamide 6 Tarnamid 27 Natural produced by Azoty Tarnów, which strengthened copper, graphite or molybdenum disulfide with varying participation in the composite. Tensile test, Brinell hardness, thermal conductivity and the tribological wear resistance were taken. The influence of the type of dopant and the participation of the studied property were analysed. The study showed the desirability of the use of graphite and copper as fillers polyamide. The resulting composites are characterized by satisfactory mechanical properties and thermal conductivity. Applied fillers also showed a positive effect on the value of the coefficient of friction wear him down much. The obtained results of newly developed composites, combined with the relatively low price of graphite and copper as compared with the price of molybdenum sulfide II may be reasons to use them as analogues of commercial mixtures of PA with MoS<sub>2</sub>. The results are original and valuable cognitive nature. They bring a new and expanded information about the effects of fillers on mechanical and physical properties. Unique data on tribological wear resistance depends on the type and amount of filler.



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The Methodology of research section represented by D. Gąsiorek, A. Meżyk, A. Skibniewski and W. Gluchowski on "Metallographic Investigations of Metal Plate Edges after Cutting" on a **page 31** informs that the cutting sheets of various materials is a commonly

used product finishing process in industrial conditions. If high quality of cut edges is required, defects caused by cutting on a guillotine make this process of finishing practically unsuitable. The Authors evaluated quality of plates after cutting in laboratory, on industrial guillotine and a rotary slitter, in order to specify a cutting method least disturbing to the product's edge. samples of multi-layered aluminium lithographic plates, divided by cardboard and paper sheets were cut in industrial conditions on a guillotine and a rotary slitter. A specially designed laboratory test stand was built, allowing measurements of forces and applying a vertical, controlled movement of the cutting blade. Surfaces of edges of the samples were examined with the use of a Scanning Electronic Microscope; results of these scans were compared and evaluated. A comparison of surfaces after cutting allowed drawing conclusions regarding methods causing minimum disturbances to the cut edges. The best quality of the cut edges was obtained on a laboratory guillotine test stand, applying a unique, vertical movement of the cutting blade. Vertical, controlled movement of the blade during cutting metal sheets offers substantial advantages to the finishing process compared to standard guillotine cutting. In all cases, when high quality of the edge surface is required, proposed vertical cutting combines high efficiency with simplicity of operations and assures high quality of the finished products.



The research paper made by P. Czop and G. Wszółek on "Model-Based Design Approach to Reducing Mechanical Vibrations" on a **page 39** presents a sensitivity analysis method based on a first-principle model in order to reduce mechanical vibrations of a hydraulic damper. The first-principle model is formulated using a system of continuous ordinary differential equations capturing usually nonlinear relations among variables of the hydraulic damper model. The model applies three categories of parameters: geometrical, physical and phenomenological ones. Geometrical and physical parameters are deduced from construction and operational documentation. The phenomenological parameters are the adjustable ones, which are estimated or adjusted based on their roughly known values, e.g. friction/damping coefficients. The proposed model-based sensitivity method can be used to optimize prototypes of hydraulic dampers. The proposed sensitivity-analysis method minimizes a risk that a hydraulic damper does not meet the customer specification.

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### 39. Model-based design approach to reducing mechanical vibrations

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