## Research monograph

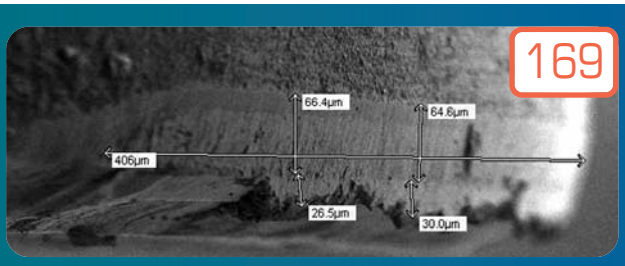


## Materials

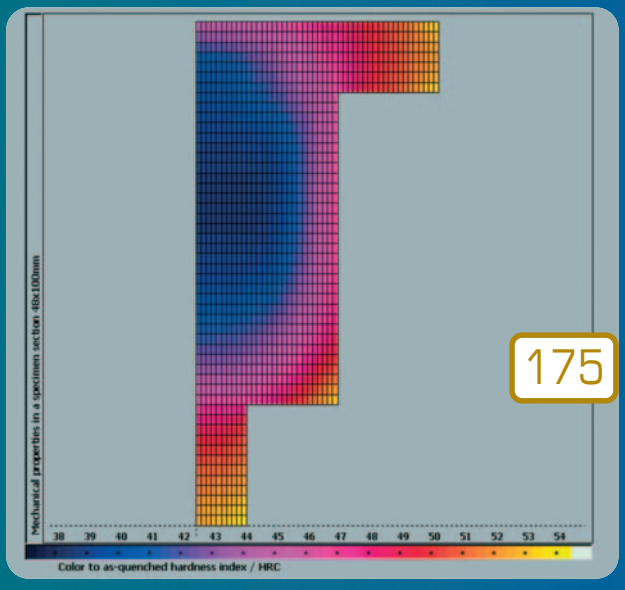


## Analysis and modelling

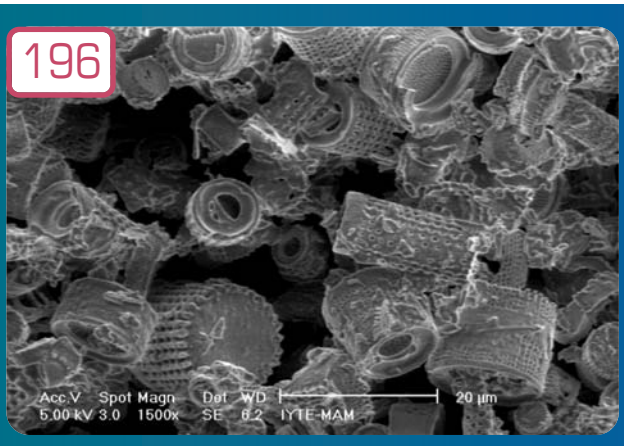




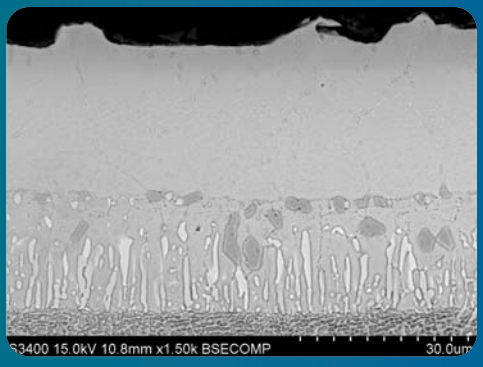

The Materials section represented by S. Thamizhmanii and H. Sulaiman on "Machinability of hard stainless steel and alloy steel using PCBN tools" on a **page 169** describes the machinability of two hard materials – AISI 440 C martensitic stainless steel and SCM 400 alloy steel. It was analysed by measuring surface roughness, tool wear, cutting force and specific cutting pressure. The approach was adopted using various operating parameters like cutting velocity, feed rate and a constant depth of cut. The results were obtained using various measuring instruments like surface roughness tester, dynamometer, scanning electron microscope. Machinability of materials was easy in machining SCM 440 alloy steel than AISI 440 C stainless steel. An analysis was done by having low specific cutting pressure, low tool wear and low surface roughness. The materials used in this experiment were not used by most of the researchers. The obtained results can be used by the other researchers and may be references.




In the paper entitled "Computer simulation of quenched and tempered steel properties" by B. Smoljan, D. Iljkić and H. Novak on a **page 175** the algorithm of estimation of mechanical properties based on steel hardness was established. Numerical modelling of hardness distribution in as-quenched steel specimen was performed by involving the results of simple experimental test, i.e., Jominy-test. Hardness of quenched and tempered steel was expressed as function of maximal hardness of actual steel and hardness of actual steel with 50% of martensite in microstructure, according to the time and temperature of tempering. Then distribution of other relevant mechanical properties was predicted based on predicted as-quenched and tempered hardness of steel. Experimental investigation was performed on low alloy steel. The established procedure for estimation of quenched and tempered properties of steel was applied in computer simulation of mechanical properties of quenched and tempered steel workpiece of complex form. The established algorithms can be used for prediction of mechanical properties in heat treating practice. Estimation of as-quenched hardness distribution is based on time, relevant for structure transformation, i.e., time of cooling from 800 to 500°C ($t_{8/5}$). The hardness in the quenched and tempered state is estimated from the as-quenched hardness. The prediction of yield strength and toughness of steel is based on steel hardness.




Authors: E. Gulturk and M. Guden in the paper entitled "Thermal and acid treatment of diatom frustules" on a **page 196** proposed that the frustules and purified silica powders obtained from frustules can be used to reinforce composites. In this study, microstructural properties of two diatom frustules were determined and different methods were investigated for silica powder processing from diatom frustules. At increasing HF concentrations, the variety of shapes, nanopores and open voids were seen on the surface of frustules as silica particles were removed from the surface. SEM micrograph results showed that HF significantly etched inside the existing pore structure of the diatom frustules. HF concentration was found more effective in mass loss than the leaching time. Thermal treatment induced several cracks propagated between macro pores and nanopores of the frustules. In this paper, the microstructural properties of ND and CD frustules were determined. The effect of thermal and acid treatment on frustules was investigated with SEM. Results show that thermal and acid treatments were not effective for obtaining silica powder from frustules. Ball milling can be used for silica powder processing from frustules in the further study.

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The Manufacturing and processing area is shown in the paper on "Oxidation behaviour of platinum modified aluminide coatings deposited by CVD method on nickel-based superalloys under air atmosphere" by M. Yavorska and J. Sieniawski on a **page 204**. Platinum coatings 3 and 7 µm thick were deposited by the electroplating process. The heat treatment of electroplating coatings at the temperature 1050°C for 2h under argon atmosphere was performed. Low activity CVD aluminizing process of platinum heat treated coatings (3 and 7µm thick) at the 1050°C for 8h using IonBond equipment was performed. Oxidation resistance at 1100°C for 1000 h in air atmosphere using furnace of Czylok company was evaluated. The microstructure investigations of platinum and palladium modified aluminide coatings were conducted by the use of optical microscope (Nikon Epiphot 300) and a scanning electron microscope (Hitachi S-3400N) equipped with an Energy Dispersive Spectroscope EDS (VOYAGER of NORAN INSTRUMENTS). The phase composition was identified by X-ray (ARL X'TRAX) diffractometer. The surface roughness parameter – Ra of modified aluminide coatings was evaluated by Perthometer S2 MAHR equippment. On the ground of the obtained results, it was found out that platinum modification of aluminide coatings provides to increase of oxidation resistance Ni-based substrates. The platinum modified aluminide coatings are widely used as coatings for turbine blades of aircraft engines.

## Manufacturing and processing