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Cover story – continued

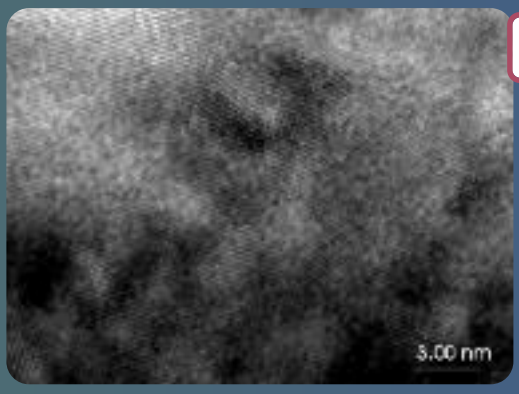
Clay guard were equipped with true weapons: bows and crossbows with arrows having arrowheads with the admixture of poisonous lead, and also swords and spears cast of rare alloys. In the chamber over 10 thousand pieces of various arms were found. From the group of chariots only terracotta horses remained in the middle of the chamber – health-looking saddle-horses with the complete dentitions, reminding the breed of Gansu and Xinjiangu. Also fragments of harness with brass buckles survived. On the cover the picture of a few soldiers was put as the main one.

The middle picture on the cover presents ceramic vessels found in Greece in the archipelago of Cyclades on the contemporary Santorini. The site of Akrotiri, a Minoan port city on the island of Thera was simultaneously destroyed and preserved by a massive volcanic eruption, which is one event which may have spawned the myth of Atlantis. Those excavations provided proves of the existence of Minoan colony which once did well there. Corridors grooved in volcanic ashes revealed two or three storeyed buildings. Professor Spyridon Nikolaou Marinatos, a founder and contemporary hero of the island, began excavations in 1967 and died at the site in 1974, after suffering a massive stroke and was buried here. So far the small part of the biggest Minoan city outside Crete, numbering even 20 thousands of citizens in its heyday was digged. The walls of buildings were decorated by imposing paintings. Most of frescos are exhibited in Athens at present. Cretan ceramics were came also across, stored in one of chambers, which was showed on the picture.

On the small picture of the cover, on the left side, one of the most wonderful and biggest Medieval mosaics, outstanding achievements of Sicilian and Norman arts in the Cathedral in Montreale near Palermo on Sicily in Italy are exposed. The Cathedral, rather austere outside with square towers, does not foresee what is hidden inside. Both cathedral and the city owe their existence to the King Wilhelm II the Good and the powerful Bishop of Palermo, an Englishman, Walter of the Mill. In 1174 Wilhelm founded the new monastery in his grounds, and a few years later in the abbey the church was built – the present cathedral. That unusual hurry produced a very profitable effect – the most famous monument of the temple, mosaics made of tiny, usually square ceramic, glass or stone elements at the golden background are of well-thought-out and uniform character and stretch for 6340 m^2. Elements are stuck to the ground e.g. by putting them on an unbounded mortar, natural resin (mastics out of *Pistacia lentiscus* tree). Mosaic decorations being a work of masters of Byzantine and Venice, made at the turn of 12th and 13th century, presents scenes from the Old and New Testaments. After coming into the church the huge 13-metre-broad and 7-metre-high figure of Christ Pantocrator (on the wooden vault of the central apse) who raises his right hand in the gesture of blessing and which is seen at the picture, pays attention. In the left hand he keeps the Holy Bible opened at the side with the caption written in Latin "I am light of the world, who comes with me will not stumble in the dark". Below there is Madonna with a Child surrounded with angels and apostles.

At present two basic groups of engineering ceramic materials can be distinguished. Porous ceramics found the application in civil engineering and refractory, clay, porcelain, enamel and abrasive products, This ceramics is also determined as traditional, classic or huge tonnage one, because it usually deals with massively produced building and refractory materials or the ones applied among others: in sanitary engineering including among others: porcelain, stoneware, roofing tiles and bricks. Porous ceramics includes clay products and refractory materials and is characterised by huge share of glassy phase surrounding crystalline components. Porous ceramics is characterised by 5-15% share of pores, after firing in high temperature, applied in order to drain water. It is composed also of cement and concrete made as a result of firing in high temperature, milling of a clinker achieved in that way into minute powder, and solidification and hardening after mixturing with water and minute sand – in a case of cement mortar, or with water, sand and aggregate – in a case of concrete. Ceramic materials applied among others in households belong to that group of ceramics. Stoneware is ceramic material made out of stoneware clay with additives composed of SiO_2, Al_2O_3, potassium, sodium and ferric oxides, fired once or twice and usually glazed. Terracotta is fired ceramic material composed of refractory clay, feldspar, quartz sand and metal oxides (pigments) and characterised with huge wear resistance. Clinker is ceramic materials fired from ferruginous, calcareous and ferruginous, calcareous and magnesious clays of huge resistance and impact resistance, little porosity and absorbability. Porcelain is sintered ceramic material made of mullite, quartz and feldspar glaze and is divided into hard and soft paste. Porcelain is fired once (non-glazed) or twice (glazed and hard). Feldspar glaze are used usually to glaze, and overglazed colour to decoration. Faience is white or ivory ceramic material, porous and usually glazed with glaze characterised with the inclination of soaking up water and significantly less resistance of porcelain. It is made of faience clays with addictives among others of quartz, feldspar and is fired twice and then glazed. As time flows, faience glaze breaks, soaks up water and becomes permanently dirty. Semi-vitreous china-ware is ivory ceramic material having intermediate properties between porcelain and faience of smaller porosity and bigger resistance than faience. It is made of faience clay, silty substance (ca. 50%), quartz and feldspar, by firing once or twice in temperature lower than porcelain. Engineering ceramics is applied in automotive and aerospace industry, in the manufacturing processes, electronics and in the high-temperature applications and medicine. Ceramic materials show also electrical and magnetic properties. The application in engineering ceramics includes wear resistant materials, bearings, car elements, energy instrumentation, endoprostheses and various elements in aerospace, air and military industry and very often cutting tools what was presented in the third small pictures, at the right. Papers presented in the subsequent issues of JAMME have been dealing mainly with this issue.

Selected materialographical photo



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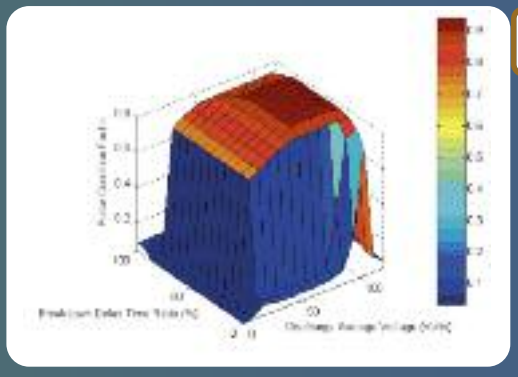
The paper entitled "Surface modification of the X40CrMoV5-1 steel by laser alloying and PVD coatings deposition" by L.A. Dobrzański, E. Jonda, K. Lukaszkowicz, K. Labisz and A. Klimpel on a **page 179** demonstrates the influence of alloying with NbC powder by the use of a high-power diode laser and TiAlN, AlSiCrN and TiCN gradient coatings deposition by PVD process on microstructure and hardness of the X40CrMoV5-1 steel surface layer. In the effect of laser alloying with powders of carbide NbC, the size reduction of microstructure as well as dispersion hardening through fused in but partially dissolved carbides and consolidation through enrichment of surface layer in alloying additions coming from dissolving carbides occurs. The structure of the PVD coatings consisted of fine crystallites while their average size was fitted within the range of 15÷50 nm, depending on the coating type. The coatings demonstrated columnar structure. Laser alloying by using different carbide powders and HPDL laser is a new way to improve the structure and mechanical properties of the hot work tool steels. Good properties of the PVD coatings and the laser treatment make these layers suitable for various technical and industrial applications.



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In the paper entitled "Optimisation of electro discharge machining parameters" by R.A. Mahdavinejad on a **page 163** the electro discharge machining (EDM) is presented. The testing results from ED machining of WC-Co confirms the capability of the system of predictive controller model based on neural network with 32.8% efficiency increasing in stock removal rate. The complexity and non-linear nature of EDM from one side, and occurrence of instability phenomenon due to the different input setting up parameters especially in machining of carbon-based materials such as non-oxide ceramics, on the other side, make the modeling of EDM process impossible with conventional methods. What is presented in this paper is the optimisation and control of EDM process using the neural model predictive control method. To achieve instantaneous data from machining condition, the new method of fuzzy analysis of single machining pulses and computing the magnitude of system condition in the form of a real number between 0 and 1, has been used.