



**Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION V
New Frontiers in Multifunctional Material Science and Processing**

**Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials
School of Electrical Engineering and Computer Science of Applied Studies**

PROGRAM AND THE BOOK OF ABSTRACTS

**Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 21st-23rd September 2016.**

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P8

Influence of alternations in ultra-centrifugal milling parameters on the coal ash quality for the construction composites design

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The coal ash mechano-chemical treatment conducted by means of the high energy mill was optimized using mathematical and statistical tools. The merits of the alternations in ash processing schemes with a referral regarding the improvement of its reactivity were highlighted. This will eventually lead to higher volume utilization of the fly ash as a cement replacement in concrete design. In order to obtain the most favorable output, the impact of the sets of processing parameters (number of rotor revolutions, current intensity, activation period, circumferential rotor speed, mill capacity) on the on the product's quality factors (grain size distribution, average grain size, micronization level, agglomeration tendency, specific surface area) was assessed via Response surface method, Standard score analysis and Principal component analysis. Quality parameters in an extensive range of processing parameters were accurately predicted with developed models. The calculated r^2 values were in the range of 0.84-0.99. The optimal ash sample, characterized by 0.93 Standard Score, was produced using a set of processing parameters appropriate to experimental sequence with applied 120 μm sieve mesh. The microstructural characteristics were assessed using image-processing values and histogram plots of the activated fly ash SEM images. Multiple comparison tests revealed that the optimal variations in the activation parameters could improve the technology of cement replacement material production and its transfer into an economically attractive sustainable solution which is a new step in the design of high-volume fly ash based composites.

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Fractal tools in terrorist and financial crime prevention

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Information society imposes globalization and universality of values. In these circumstances, terrorism, institutional political violence which targets trying to achieve the morbid fear of provoking a spectacular way, inappropriately given conditions, becomes a real threat not only to the nations but also to politics on the global level. In 1996, the International Monetary Fund estimated that 2–5% of the worldwide global economy involved laundered money. Today, intelligence activities in preventing and combatting terrorism include financial investigations and money laundering for the purpose of financing terrorism, resulting in broadening of the

scope of data to the level which makes it impossible for human logical evaluation. Technologies development that enables increasing capacity of speed and the amount of data processing has enabled defining, analysing and exploring more and more models. This led to the idea of computer experiments and simulations trying to get to more complex planning and forecasting for the purpose of countering terrorism and “dirty” money transaction, as highly dangerous, complex and variable phenomena. This presentation aims at quotation the wide spectrum of mathematically founded fractal concepts suited to generate computer models of anti-terrorist activities. In this sense, the logistic behind the items connected with detecting and recognizing degree of terroristic threat by comparing fractal structure of people’s faces, fast search through the databases of faces and fingerprints. The speed of searching processes is of vital importance which promotes the crucial importance of compression and data reduction with preservation of regularity. Especially important are analytic forecasting of missing visual data and forms, to supplement the empirical evidences and records. All these operations are possible with higher degree of knowledge utilization and adaptation of virtual reality in the fight against terrorism and different forms of money laundering. The results indicate that the achievements implementation of the concept of fractals depends on substantial prior knowledge, environmental influences, subsystem integration, decentralization and synchronization, and allows us to come up with similar high information technology models, but not necessarily to enable identification of the authentic features of the various anomalies that result in objectively asocial consequences. In this sense, we conclude that the application of information technology in the fight against terrorism, based on the concept of fractals has its place in the arsenal of anti-terroristic prevention.

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Effects of SA surface treatment on the properties of CaCO_3 used as filler in construction composites

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Calcium carbonate (CaCO_3) is mineral filler that has been most extensively used in the construction composites as well as in the polymer industry. Coarse CaCO_3 grains can be easily incorporated into the composite material, but the smaller-sized particles tend to agglomerate due to the enhanced particle-to-particle interactions, which leads to serious performance problems. The most efficient way of surpassing this problem is to enhance the final composite properties by surface treatment of the filler with a surfactant. Following such procedure a water-repellent construction composites are obtained (i.e. reparation mortars, mortars for the exterior works, thin coatings for concrete walls, etc.). The stearic acid is a universal and economical surfactant which is often used to improve CaCO_3 hydrophobic properties. This study investigates and subsequently compares the surface and mechanical properties of untreated ground calcium carbonate powder and treated powder with stearic acid using a dry process coating system. The CaCO_3 powder (grain size class: $-200 + 63 \mu\text{m}$) was pulverized in a laboratory Retsch-ZM-1 mill with a $250 \mu\text{m}$ mesh size sieve and a peripheral comminuting path. The surface of CaCO_3 powder is