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A new material's experiment: Data mining for modeling and creation of knowledge base

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What does it mean that you have done an experiment? This means that you have tables and graphs. The main question that we want to put here is how could you increase the significance (profit, price) of tables and graphs? For example: How could you generalize them? How could you use them to solve an inverse problem? Could you predict the results of experiments that you were not being able to execute? There is another main question. Is it possible to present the results of experimental research as Knowledge Base? Under Knowledge Base, we mean information tool, containing all relationships between all variables of object, allowing to calculate a value of one variable through others, solving both direct and inverse problems, predicting the characteristics of object which did not studies yet.

Data Mining for Modeling: Data Mining (DM) is collection of information processing tools such as artificial neural networks (ANN), self-organization maps, etc. We present the ANN multifactor computational models of characteristics of nano films of linear-chain carbon (LCC) with embedded into LCC various atoms (LCCA) that depict how we solve the questions and problems which we have formulated above. The LCCA is manufacturing in Chuvash State University, using unique technology protected by patent. The LCCA can be of great interest for solid-state electronics, photovoltaic elements, sensors, etc. We present ANN-models that allow us to reveal all dependences between variables, to generalize them, and to calculate the physical-electrical and optical properties of LCCA in dependence on amount of kind of atoms (one or two kinds) embedded in LCCA, kind of atoms (number and group of atom in accordance with the Mendeleev's table), and the thickness of LCCA. The models allow us to predict current-voltage characteristic and transmittance spectrum of any new sort of LCCA with any atom of Mendeleev's periodic table. The models allow also to solve inverse task: to determine amount of kind of atoms, kind of atoms, and thickness of LCCA that provide the required current-voltage characteristics and transmission spectrum. We could consider the models ensemble which we have obtained as the first example of Knowledge Base in field of material's science.

Data Mining for Creation of Knowledge Base: A lot of experimental data is obtained in material's science nowadays and it grows every day. Therefore, it is time "to collect stones" and to develop an information tool for generalization of experimental results obtained. It is time to create a Materials Computational Tool like Human Genome in order to solve the problem of "big volume of data". We consider a creation of Knowledge Base as the first step for solution this problem and we invite participants of Materials Science 2014 who are interested in the creation of the multifactor computational models in area of material's science to collaborate with our team. We can present a totality of yours experimental results in a form of yours Knowledge Base.

We belive that Knowledge Base is a future of material's world.

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Understanding the effect of equal channel angular pressing on response of a magnesium alloy

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Equal Channel Angular Pressing (ECAP) is a metal forming technique being used to refine the grain size of metals and its alloys for improving their properties. In the present work, AZ31 wrought magnesium alloy has been used as a material to extrude under ECAP technique. Characteristic studies have been done on the AZ31 alloy up to four ECAP passes at temperature of 498 K for route BC. Initially, the average grain size of the as received material was observed to be 31.8 μm. After 4 ECAP passes, the average grain size of the alloy was reduced to be 6.7 μm at a temperature of 498 K following route Bc. Tensile test has been carried out to observe the improvement of material properties at room temperature. Hardness of the material was increased with increase in number of ECAP passes when compared to as received material. Moreover, X-ray diffraction analysis has been done on as received and for ECAP processed material at 4 pass.

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