

Animesh Roy of Visva Bharati University presented his paper titled "Chaos synchronization and cryptography for network security". As mentioned by the speaker, the main objective of the work is to study the synchronization and chaotic properties of different nonlinear dynamical systems such as semiconductor lasers, vertical cavity surface emitting lasers which exhibit chaos. These systems, according to the author, are then used for data transmission by means of cryptosystem. Supriya Chaudhuri of Ramkrishna Mission Vivekananda University presented his paper titled "Effect of quantum plasma on the structural properties on Ne". In the paper they have stressed that correlated results for the free systems compare well with the existing experimental values. The author also feels that the results under plasma environment are completely new and are likely to be useful for plasma diagnostic determination. Hiya Mandal of Jadavpur University presented her paper titled "A Non-linear Model for Magnetoconvection". In her paper she has developed a non-linear low dimensional model for low-Prandtl-number fluids with rigid boundaries. She has discussed the advantages of the model. The last paper of the

session was by Satyajit Chowdhury of Saha Institute of Nuclear Physics, Kolkata. The title of his paper was "First experimental observation of Electron Acoustic Wave Propagation in Laboratory Plasma". The author has elaborated the experimental methodologies and stated that the observed phase velocity agrees well with the theoretical estimate. He also hopes that experimental realization of the mode may open up a new avenue in the Electron Acoustic Wave research.

After the technical sessions were over, the AGM of the 'Advanced Centre for Nonlinear and Complex Phenomena' (ACNCP) was held followed by a formal tea break. That completed the national seminar, which was well attended and was nicely organized.

(Some glimpses of the event are in back inside cover)

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News Review

Geopolymer as a substitute for concrete

Raw materials: Geopolymer as mineral binding medium is environment protector and resistant against chemicals and heat. Concrete is valid as climate-killer and definitely because of cement whose manufacture through pulverization and burning of stone causes huge consumption of energy. To that climate damaging carbon dioxide (CO_2) out of which existing limestone is separated. More than 5% of worldwide emissions of CO_2 is generated as consequence of the cement manufacture.

Therefore Eddie Koenders, civil engineer and manager of the Institute for Raw Materials in Civil Engineering of TU Darmstadt – searcher

for climate-friendly alternative and discovered geopolymer. That is two component system of a reactive stable material which contains silicon and aluminium oxide as also a basic activating solution out of alkali hydroxide or silicates in water. Like cement the rigid material consists of natural stone. The mixture of pulverized stable material with the activating solutions then becomes a stone like inorganic polymer.

Although since 1970's research was done on geopolymers but it has not made breakthrough in the wholesale market. This situation could change since its potential as climate-friendly binding

material was recognized in the construction sector. “The international interest is big” – Koenders is happy with that. He has made agreement with entrepreneurs and also researchers of Spain, France, Austria, Great Britain UE sponsors.

Exist materials from the geopolymers is metakeolin – a heat treated form of kaolin clay. With 600°C kaolin changes its structure, becomes reactive and hardens out quickly in mixing process. Nevertheless the heat-treatment of kaolin needs also much energy.

Kaolin contains in contrast to limestone no bound CO₂ that in burning process is expelled. And in burning much lower temperature is necessary than with cement burning which works positively on the CO₂ balance. Geopolymer on the basis of metakaolin retain with the processing otherwise. So these become liquid when stirred and then turn to gel like substance. With agitation or shaking these become liquid. The activation solution causes to that a certain stickiness/viscosity of the substance and renders difficult the peeling off of building components.

Geopolymers become concrete and cement in bigger standard replace when they exhibit the similar consistency – says Koenders. With his team he tests therefore different prescriptions in order to improve the handling of kaolin which contains ironoxide and other foreign materials, turns out to be suitable and over and above cost effective.

Also fly ashes from flue gas or vulcanizing trash can be mixed together. So its abundance of alkaline metals is favourable. So the concentrations of alkaline activation solution get reduced, which reduces the cost. In focus of the researchers stand to the admixtures which lends the substitute concrete new properties.

Still cement is valid as worldwide most frequently used building material, nevertheless the geopolymers can make it cease to remain in the rank for special application. It has also the advantages. These are more stable in heat than concrete whose incorporated water builds in case of fire a steam pressure which leads to the cracks and blank spaces. These are resistance against chemicals, as these do not contain lime, which in contact with acids and aggressive substance dissolve. Already after one day the geopolymers develop similar compressive strength. These effect quick removal of shuttering and become suitable or mass production of precast components.

At present the researchers at Darmstadt experiment with chemically resistant sewage pipes of geopolymers. These are certainly at present still costlier than those made of cement or concrete – says Koenders, however, their durability if rightly prepared make them by all means of higher price.

Anil Kumar Ghosh

Source: VDI nachrichten,
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Dark Matter: on the way to Discovery

Particle Physics: The most sensitive detector in the whole world is located deep under the Italian Massive Gran Sasso. In cosmos the known materials constitute only 5%. Planets and stars are built of these. Astronomical observations,

however, suggest that in universe there must be much more of an unknown material which takes away so far the direct proof. This so called dark matter – the real ruler is the universe as it holds together the galaxies.