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DAY 1

Keynote Forum

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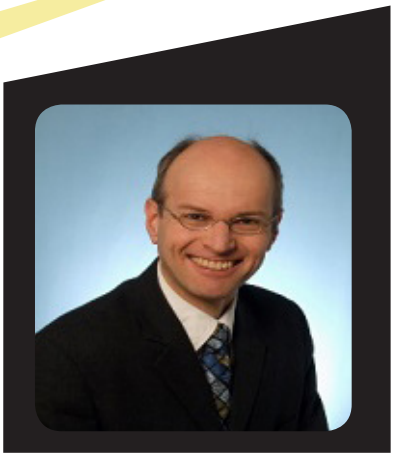

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CORROSION PROTECTION WITH GRAPHENE

Graphene can now be produced on large industrial scale. Most of these processes generate few layer graphene. This sets the focus on how graphene can be incorporated into industrial applications. The Sixth Element has established a proprietary process to manufacture different types of graphene with specific designed properties for different applications. Products of Sixth Element are registered according REACh. Research on how using graphene in coatings started 2013 focusing on reducing zinc in solvent based corrosion protection primers. In standard primers with high zinc content, zinc acts as cathodic sacrifice layer, as zinc is the more ignoble metal, therefore protecting the underlaying metal substrate. When the zinc is oxidized, the resulting zinc oxide builds up a barrier, which prevents the attack of the surrounding media to the metal substrate. The idea was to design a graphene type, being electrical conductive enough to support any cathodic function of the system and able to act as a barrier without producing a battery cell. A further requirement was that such a graphene can be processed with standard equipment used in the coating industry. Cooperating with an industrial partner in China, Toppen Co, the graphene type SE1132 was developed, a few layer graphene with a medium conductivity. Addition of 1% SE1132 to an epoxy primer system and reducing the zinc content to 25% (based on dry substance) show significant improvements in salt spray testing and water condensation testing compared to a standard zinc rich epoxy primer. The results have been confirmed by measuring the corrosion current of such a system. The 1% addition shows the lowest current. In China Sixth Element has received a patent for this development. Based on independent tests of Chinese authorities the system containing 1% graphene (based on dry substance) is approved for off-shore applications. The system was first applied to protect the steel construction of an off-shore wind energy tower in 2015. Meanwhile more off-shore projects have used this system. Contrary to this, in Europe the development of such systems is in the prototyping stage. Based on these findings, prototypes of water-based and powder coating systems have been developed; showing that graphene also in these systems enhances corrosion significantly. Development of commercially available products is ongoing. An update on latest developments will be given at the conference

Biography

Bernhard Münzing has started his career at BASF selling fibre reinforced prepreg-systems mainly to the aerospace and sports industry, being an Economic Engineer. He then joined L. Brüggemann responsible for Materials Management and introduction of new products to the market. After short period as Sales Manager for a coating company, he worked for more than 17 years for GELITA, world leading gelatine manufacturer. Covering all applications areas for gelatine, he helped customers to adopt the gelatine products during the critical phase of the BSE disease, followed by a position in business development for more than ten years. Aside that he was the responsible key Account Manager for one of the largest GELITA customers in Asia. Since Jul' 2016, he is Sales Director of The Sixth Element, a leading supplier of different graphene products, responsible for all markets outside China with focus on EMEA region.

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SYNTHESIS OF PT SUBNANO CATALYST USING A DENDRIMER REACTOR

Dendrimers are highly branched organic macromolecules with successive layers or generations of branch units surrounding a central core. Organic inorganic hybrid versions have also been produced, by trapping metal ions or metal clusters within the voids of the dendrimers. Their unusual, tree-like topology endows these nanometer-sized macromolecules with a gradient in branch density from the interior to the exterior, which can be exploited to direct the transfer of charge and energy from the dendrimer periphery to its core. We show that tinchloride, $SnCl_2$ and $FeCl_3$ complexes to the imines groups of a spherical polyphenyl azomethine dendrimer in a stepwise fashion according to an electron gradient, with complexation in a more peripheral generation proceeding only after complexation in generations closer to the core has been completed. By attaching an electron-withdrawing group to the dendrimer core, we are able to change the complexation pattern, so that the core imines are complexed last. By further extending this strategy, it should be possible to control the number and location of metal ions incorporated into dendrimer structures, which might and uses as tailored catalysts, building blocks, or fine-controlled clusters for advanced materials. The metal-assembly in a discrete molecule can be converted to a size-regulated metal particle with a size smaller than 1 nm as a molecular reactor. Due to the well-defined number of metal particles in the subnanometer size region, its property is much different from that of bulk or general metal nanoparticles.

Biography

Kimihisa Yamamoto has received his PhD degrees in Polymer Chemistry from Waseda University in 1990. He joined the Department of Chemistry at Keio University from 1997 as a Professor. Currently, he is a Professor in the Laboratory of Chemistry and Life Science, Tokyo Institute of Technology since 2010. He is a Project Leader for Yamamoto Atom Hybrid Project adopted as a Japan Science and Technology Agency (JST), Strategic Basic Research Program (ERATO) started in October, 2015.

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PREPARATION OF NANO-ASPHALT FROM NATURAL ASPHALT

Research on nano asphalt offers a promising prospect because it can significantly enhance the performance of asphalts at both low and high temperature. Nanoparticles are the key materials that can improve mechanical and physical properties also durability in road pavement. It has been reported that adding of nanomaterials such as nanosilica, nano calcium carbonate, nanotubes, and nanoclay in asphalts mixture will increase the viscosity of asphalt binders and improves the rutting and fatigue resistance of asphalt mixtures. Several attempts have been conducted to make nano asphalt i.e. by mixing mineral nanoparticles or oxides into the asphalt. However, this method has some disadvantages such as the tendency of the nanoparticles to agglomerate and the difficulty to distribute them evenly in the asphalt mixture because of the high viscosity of asphalt. Also, the price of those nanoparticles is still expensive. In this work, we are using a facile and economical method to produce nano asphalt. The nanoparticles are produced directly during the process from the natural asphalt in the Asbuton rocks which are found in Buton Island (Indonesia). The nanoparticles are produced and mixed evenly in the system by combining the microemulsion method and ultrasonication. Therefore, it is not necessary to purchase the expensive nanoparticles for making nano asphalt. The influence parameters such as the concentration and kind of solvent, concentration and kind of surfactant, and mixing temperature were studied. The little amount of both solvent and surfactant that are used in this method (less than 5%) with the high yield of each variation (around 99%), make this process worth to be developed and applied in the road pavement.

Biography

Riny Yolandha Parapat has her expertise in synthesis of nanomaterial via microemulsions technique. Her great passion is to create and develop nanomaterials. Because she is also concerned about the environment, her research is focusing more to produce nanomaterials by utilization of natural resources such as natural reductant and natural asphalt. Her advance knowledge and experience in microemulsions making her able to synthesize and design nanomaterials. She has discovered a new method to synthesize highly active supported nano catalysts, also formulate the nano asphalt. Not only she is active in doing research, she is also a Lecturer in the course of kinetic and catalysis, experimental design, process control and plant design.

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