# DAY 1

Keynote Forum


Euroscicon Conference on

# Physical Chemistry and Analytical Separation Techniques 2018

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# SHORT RANGE ORDER, CRYSTAL NUCLEATION AND CRYSTAL GROWTH IN LIQUID COLLOIDAL SUSPENSIONS

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**Colloidal suspensions are model systems to study phase transformations of first order as crystallization of a liquid system. The particles of colloidal suspensions are in size of several hundred nanometres and the carrier fluid is transparent in the spectrum of visual light. These characteristic features make colloidal suspensions easily accessible for optical investigations. The structural transformations are very sluggish and can be monitored in-situ. In the present work, light scattering experiments are performed to investigate homogeneous nucleation in the interior and heterogeneous nucleation on the container walls of silica colloidal suspensions and to measure the growth velocity of the crystal. Since nucleation processes require short-range ordering as precursor of their formation, we conduct ultra-small-angle scattering of X-rays of synchrotron radiation at DESY Hamburg to determine the topological short-range order of monodisperse colloidal suspensions in liquid phase far away from thermodynamic equilibrium. In such a way, the entire pathway of crystallization from the stable liquid to the metastable liquid state, the formation of short-range ordering over crystal nucleation and eventually crystal growth is quantitatively investigated. The experimental results are analysed within current models of formation of aggregates of different structure, classical nucleation theory and the Wilson-Frenkel theory of crystal growth. From measurements of crystal growth and its analysis within the Wilson-Frenkel theory, the deviation from thermodynamic equilibrium of a shear melted crystal is inferred as defined by the difference of chemical potential between the metastable liquid and the stable solid. The in-situ investigations of homogeneous crystal nucleation are used to determine the solid-liquid interface which is very difficult to measure by other methods. The measurement of the growth of a planar liquid-solid interface allows for detailed information of the particle attachment kinetics of particles from the liquid to the crystal**

## Biography

Dieter M Herlach has studied Physics at the RWTH Aachen University and has received the Doctoral degree as *Doctor rerum naturalium* from the same university. He was Group Leader at the Institute of Materials Physics in Space and Senior Scientist of the German Aerospace Center DLR. He is Full Professor in Physics at Ruhr-Universität Bochum (RUB). He has authored over 300 scientific publications in refereed journals and served as Editor of six books. He educated more than 30 PhD students. He lead projects of the German Research Foundation, the German Aerospace Center-Space Management, European Space Agency and was Principal Investigator of NASA during three spacelab missions. He initiated and coordinated two priority programs of the German Research Foundation (DFG), He is Honorary Professor of three universities. He chaired the Division of Metal and Materials Physics of the German Physical Society DPG, and was an Elected Member of the council of DPG, General Review Committee of DFGand Deputy Chairman of the German Society of Materials Science and Engineering.

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# WATERBORNE TOPCOATS: IT IS THE FINAL FLOW THAT MAKES THE COATING SHINE

## Bart Reuvers and A Veurink

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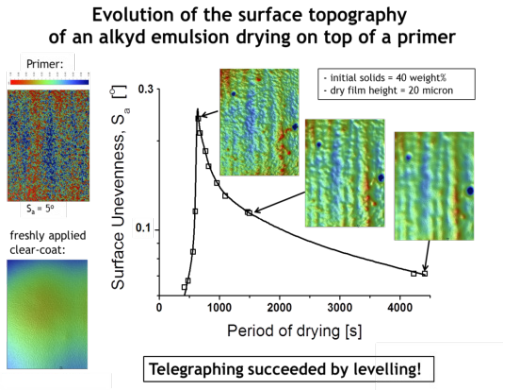
How to achieve a high-gloss surface for a water-borne coating drying on top of an uneven substrate? To answer this question, we examined the gloss level of dried topcoats as a function of a series variables both related to the substrate (: topography) and the topcoat (: volume fraction non-volatile components, film thickness, viscosity of the emulsified binder and rate of X-linking). To reveal the basic mechanisms underlying gloss development, we monitored the evolution of the surface topography of drying topcoats, using a white light interferometer. The study revealed the existence of two distinct different stages in the evolution of the surface topography. Firstly, the glossy wet film surface becomes uneven due to (damped) telegraphing of the substrate unevenness, driven by evaporation of water. This process is accompanied by loss of gloss. After coalescence of the emulsified binder particles subsequently, the telegraphed unevenness levels out driven by pressure gradients. This process results into gloss recovery. Full gloss recovery is promoted by low viscosity of the emulsified binder, high film thickness and slow X-linking




## Biography

Bart Reuvers has completed his PhD from Twente University. He worked as a Physical Chemist at Akzo Nobel Coatings for 20 years. Currently, he is working as a Senior Scientist at DSM Resins in the field of Rheology. He has published more than ten papers in reputed journals.

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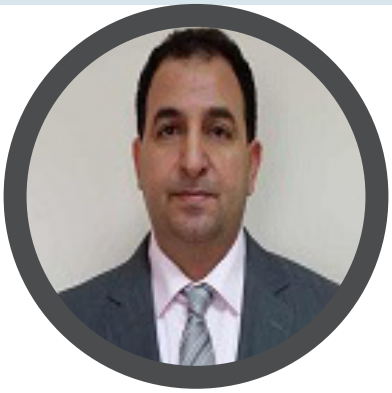
# FUTURE OF NANOMATERIALS IN HYDROGEN ENERGY AND EFFICIENCY OF HYDROGEN STORAGE

**Amin A ElMeligi**
AMA International University Bahrain, Bahrain



Over ten years, hydrogen energy has been applied in transportation. The infrastructure has been built and still in progress but construction can be expensive, estimated to be $1 to $2 million per hydrogen station. Hydrogen energy is clean with zero pollution. Hydrogen is a suitable source of energy since it can easily be used in automobiles similar to gasoline. The main concern is the onboard storage, which is considered as one of main barriers for utilizing hydrogen as a source of fuel. The main concern is the storage of hydrogen to be safely applied. There is a development in the hydrogen storage materials, especially nanomaterials. Recently, polyaniline is shown to possess outstanding hydrogen storage properties by carefully modifying the nanostructure of the material. By reducing the crystallite size of the hydrogen storage material such as hydride materials, nanolayered materials, the hydrogen storage can be improved. More research is needed to increase and to improve the efficiency of hydrogen storage materials

## Biography

Amin A ElMeligi is a Professor of Physical Chemistry and Dean of student affairs at AMA International University, Math and Natural Science Department, Bahrain and National Research Centre, Centre of Excellence for Advanced Science, Physical Chemistry Department, Egypt. He has received his BSc and MSc from Cairo University. He received his PhD from UMIST, Manchester, UK and Cairo University, Egypt under joined supervision system. He has over 25 years of research and teaching experience. He participated in a number of national and international research projects. He is a Member of international and national organization, especially, International Centre for Diffraction Data (ICDD), USA. He was a Visiting Scientist from 2000 to 2004 at University of Durham, Chemistry Department. He is a frequent speaker in national and international conferences on materials and renewable energy, especially hydrogen storage materials, hydrogen productions and hydrogen energy and layered nanomaterials. He has published more than 35 papers in reputed journals and has been serving as an Editorial Board Member and Reviewer of reputable journals.

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