ADVANCED MATERIALS

Dr. *Montgomery*, General Motors Res. Labs, reviewed the various existing liquid crystal systems and concentrated on those appearing to be most suited for large area switching devices. The polymer-dispersed and encapsulated liquid crystal films are either opaque (scattering) or transmitting, depending on the mismatch or match of the refractive indices of the liquid crystal particles and the host polymer. The operating temperatures are limited to the range $-20\,^{\circ}C$ to $+100\,^{\circ}C$. The response time makes them useful for most outdoor applications such as: solar control, automotive privacy, signs and eventually automotive displays. The on-state transmittance ($\sim 65\%$) restricts their use in areas where higher transmittances are required: windshields in cars and windows in buildings. For the future it seems important to reduce haze, increase durability, reduce operating voltage and improve solar attenuation characteristics so that this technology can find applications beyond its present technical limits.

Photochromism can be defined as a light-induced reversible photochemical process which results in a color change. The photochromic systems can be classified as either inorganic, organic, or those applying photophysical processes. Dr. *N. Chu*, American Optical Corp., suggested the following candidate materials: photochromic glasses, photochromic plastics activated by silver halides, and photochromic plastics activated by spirooxazines. The spirooxazines change from colorless to blue. They could find applications both in automotive windshields and sunroofs as well as for retrofit polyester films in glazings and window shades. However, the R&D program for the spirooxazines seems still to be in its infancy. The temperature sensitivity may be a problem, particularly in automotive applications. Also the light fatigue resistance limits the product lifetime and needs to be improved for window applications.

Dr. *T. Hjertberg* reported on research on conducting polymers. He identified the problems involved as: low stability, difficulties in processing due to bad mechanical properties and lower conductivity than desired. Dr. *O. Wennerström* reported on photochromic effects in organic materials.

A program that has caught a lot of interest is that reported by Professor *T. Lagervall*. His ferroelectric liquid crystal devices have an extremely short switching-time in addition to high contrast angles. This technology has already been commercialized by Canon for high definition information screens.

Professor *C.-G. Granqvist* reported on research carried out on a new electrochromic device based on Li_xWO_3 and VO_5. A new polymeric electrolyte with adhesive properties is applied as a lamination material in a five layer structure. He also reported on some very interesting results on thermochromic coatings made of VO_2. However, durability still has to be verified before marketing. The electrochromic device has reached the point of process development which has been triggered by the advent of the new solid polymeric electrolytes.

The workshop on Large Area Chromogenics was a very exciting and important meeting. Most intriguing is the fact that this area involves a large amount of high level basic research and will have a huge potential impact on daily life when this technology enters the market. It seems to be a supreme example of the synergetic effects achieved by combining academic research with industrial product development.

Storage and Transfer of Molecular Information in Strasbourg

By Jean-Paul Behr*

The European Parliament in Strasbourg housed the first congress "Espaces Européens des Sciences" from July 2–6, 1989. This symposium was organized by Fondation Alsace under the scientific direction of *J. M. Lehn* and *P. Chambon* and made possible the meeting of some thirty world renowned biologists, chemists and physicists to think over a common theme: "Storage and Transfer of Molecular Information". Although the time schedule was planned to imbricate disciplines and research fields, all lectures were centered on recognition processes at the molecular level, involving either the complex functions that workers in contemporary biology are trying to understand, or the highly elaborate molecules or molecular assemblies that chemists are able to make and handle, or approaches to the study of molecular signals and addressing that physicists are developing.

G. H. Khorana (MIT) opened the symposium by showing how light is transduced into chemical signals through rhodopsin molecules in highly organized systems as different as the eye's visual receptor cell and a photosensitive bacteria. The cascade of events in the former system was followed further down to the level of the nerve by *L. Stryer* (Stanford)

[*] Dr. J.-P. Behr
Institut Le Bel
Strasbourg (France)

whereas *M. Chabre* (Grenoble) proceeded to unravel the short term memory and signal amplification brought about by transducin; Other guanosine triphosphate (GTP)-binding proteins acting as intracellular messengers were reviewed by *Y. Kaziro* (Tokyo).

Soon it became clear that the crucial regions where things happen for biologists, chemists and physicists are liquid cristalline or solid-liquid interfaces. Electronic connection of the interior of redox enzymes to an electrode was cleverly done through a molecular charge relay by *A. Heller* (Austin) and his presentation was followed by other solid state aspects of information transfer (*H. C. Wolf*, Stuttgart; *H. McConnell*, Stanford). Oriented molecular films were reviewed by the pioneer of monolayer assemblies (*H. Kuhn*, Tschingel); chemical variations on bilayer membranes were introduced by *T. Kunitake* (Kyushu), and *H. Ringsdorf* (Mainz) reported in a humorous manner how these membranes could be made to perform complex molecular recognition functions. Supramolecular chemistry was brilliantly reviewed and illustrated with intertwined molecules by *F. Stoddart* (Sheffield).

Then a major question was raised. Are molecular computers feasible? This challenging call for new molecules was answered in the affirmative on a theoretical background (*J. Hopfield*, Caltech) but many technical difficulties appear at the interface between the molecular and macroscopic worlds (*D. Haarer*, Bayreuth—see the Editorial Essay in this issue) although the scanning tunneling microscope should allow us to address single molecules (*B. Michel*, IBM Rüschlikon). On the biomimetic side, *A. Eschenmoser* (ETH Zürich) and *C. Hélène* (Paris) have worked on chemical modifications of nucleic acids, whereas present and putative possibilities for tailored catalytic antibodies were presented by *R. A. Lerner* (La Jolla).

Immune response and morphogenesis are overwhelmingly complex physiological processes, yet after the lectures of *G. Edelman* (New-York) on topobiology, *R. Axel* (Columbia) on membrane receptors, and the more structural approach of *J. Strominger* (Harvard), even the journalists in the audience knew about cell to cell communication.

Where is the genetic information of living organisms stored, and how is it processed? Before the most eminent molecular geneticists took over, *M. Eigen* (Göttingen)

showed how the genetic code and self replicating molecules could originate, and *M. Lahav* (Rehovot) presented elegant interfacial crystallization experiments able to amplify chirality in a non-chiral environment. Then, *R. E. Dickerson* (UCLA), *S. C. Harrison* (Harvard), *A. Rich* (MIT) and *M. Ptashne* (Harvard) presented the various structural aspects of the regulation of gene expression at the transcriptional level, and *T. Steitz* (Yale) gave structural details of a tRNA synthetase. tRNA complexes are involved in translation of the genetic code.

The symposium ended with *S. Numa* (Kyoto) and *J. P. Changeux* (Paris) lecturing on a topic close to the first one: signal transfer in living systems, in this case, neurotransmitter receptors. On July 6, at 8 p.m., after some 35 hours of presentations and interdisciplinary discussions, the lecture theater was still full, a sign of the success of this meeting. This prompted *M. Neitzert*, President of Fondation Alsace (with the financial support of GMA, Matra, Rhône-Poulenc and Squibb) to plan the second meeting of this series for next year.

International Conference on Synthetic Metals (ICSM '90), 3–7 September 1990 in Tübingen, FRG

The conference will provide an interdisciplinary forum for the discussion of recent experimental and theoretical results in physics, chemistry, and the application of all synthetic metals (low-dimensional conductors). Sessions on the following topics are anticipated: Theory of organic conducting crystals, Synthesis and structure of new organic conducting crystals, Organic superconductors, Theory of organic conducting polymers, Synthesis and structure of organic conducting polymers, Properties of organic conducting polymers, Nonlinear optical properties, Pyropolymers and graphitic materials, Transition metal chalcogenides and oxides, Bronzes and other inorganic crystals, Other organic and inorganic conducting crystals, Ferromagnetic polymers and charge transfer salts, New low-dimensional materials, Application of synthetic metals.

Further information can be obtained from the German Chemical Society (GDCh) at the following address: GDCh, Dr. J. Wendenburg, Abt. Tagungen ICSM' 90, Varrentrappstr. 40, D-6000 Frankfurt 90, FRG, Telefax: 069/7917-475.