liquid crystallography

Gathered at the second international Liquid Crystal Conference at Kent, Ohio

ELECTRO-OPTICS

Clear-opaque window

A four-inch square window that can change from transparent to opaque in 300 microseconds at any desired time has been produced in New York.

Much larger glass panes could be made, Dr. Alvin M. Marks of Marks Polarized Corp., Whitestone, reported. The fast response occurs when the liquid crystal material is affected by heat from an electric current, which can be switched on by a photocell.

The principle is now in use in automatic goggles, and could also have applications for large display signs.

Response time for the long-lived material, Dr. Marks said, could be decreased to one microsecond. However, for most applications, such as windows, the timing already achieved is sufficient. The windows are coated with a suspension of submicron dipoles, the exact composition of which Dr. Marks is not revealing.

GUEST-HOST INTERACTION

Color changes with electric field

A new electro-optic effect involves liquid crystals with a guest dye whose molecules are oriented in an electric field by the host material.

When using methyl red as the dye, an applied electric field of 40 kilovolts changes the color from reddish-orange to yellow within five milliseconds for a layer one-half a mil thick. The liquid is contained between two glass electrodes.

Because the spacing is so close, the liquid is confined by capillary action, and none of the conventional difficulties of handling liquids are encountered.

The ability to orient dyes in liquid crystals by an electric field should be a useful tool for the spectroscopist, said Drs. George H. Heilmeier and L.A. Zanoni of RCA Laboratories, Princeton, N.J. In addition, the ability to tune the transmission characteristics of the host-guest material electrically using low voltage may find application as a light valve.

PHYSICAL CHEMISTRY

Thermal mapping for electronics

The most prominent applications of cholesteric liquid crystals are in thermal mapping of living systems and in color displays of electronic components.

Dr. G. V. Lukianoff of International Business Machines outlined problems associated with industrial uses of such materials to measure the temperature distributions of operating devices or to detect heat-producing malfunctions of those under development.

There have been problems in obtaining an even coating of the temperature-sensing liquid crystal on the industrial device being tested. But these problems are now being overcome using liquid crystals combined with a clear plastic, which provides a uniform coating and decreases the thermal motion that otherwise disrupts alignment.

BLOOD

Viscosity of red cells

Dr. Leopold Dintenfass of the University of Sydney in Australia finds that the viscosity of the internal fluid in red cells can vary over a range of 20 units, depending upon whether the cell is from a normal patient or from a victim of sickle cell anemia.

The molecular structure of the membrane surrounding red cells, he reported, is composed of two main phases. One is liquid crystalline in structure and the other is a loose network of proteins. This model is "compatible with current ideas on biological membranes," and with catalytic reactions within the cell.

The viscosity of blood, or of a suspension of red cells, is also very low, Dr. Dintenfass found.

PROTEIN STRUCTURE

Side chains on polypeptides

Scientists have long known that the backbone of polypeptides, constituents of proteins such as are found in muscle, is the alpha helix.

This structure is still recognized as the backbone, but three British scientists have discovered that benzene chains some 10 or 11 molecules long sprout from it.

They reached this new model of a polypeptide in trying to account for the diffraction pattern observed in muscle protein. The pattern is probably due to these benzene side chains, which join to form long strings.

Drs. David Perry, Arthur A. Elliott and John M. Squire of the Medical Research Council biophysics research unit find these strings gradually twist around the alpha helix backbone, taking about six strands to do so. The pitch of the benzene chains is 330 angstroms, Dr. Squire reported. The chains do not fit any standard theory so far proposed, he said.

CELLULAR MICROSCOPY

Cell surface structure

The surface membrane, or outside coating, of most types of cells in the human body are very stable; yet they also have some minute filaments that are very flexible and outward seeking. Electron microscope photographs show these structures very clearly.

Dr. E. J. Ambrose of the Chester Beatty Research Institute of the Royal Cancer Hospital in London has taken pictures of cell membrane with a scanning electron microscope developed by Cambridge Instrument Co. These show not only the flexible filaments, but a wave-like motion on the cell surface where it contacts the slide.

Such a region of undulating motion where a cell's membrane contacts a smooth surface had been predicted theoretically. However, Dr. Ambrose believes he has taken the first photograph confirming this prediction.

The slides he showed at the meeting clearly portrayed both the wave-like characteristics and the thread-like tentacles of a moving cell's membrane.