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Periodicity measurements in liquid crystal lattices MERRILL GARNETT, CHIRAKKAL KRISHNAN, Garnett McKeen Lab, Inc. — Electrochemical impedance is used to characterize surface corrosion, and for batteries and fuel cells. For most data, the impedance locus is in the first quadrant of the complex plane where the capacitive semi-circle is seen. We use electrochemical impedance to examine the periodicity of water-soluble liquid crystals. Systems examined include DNA, prothrombin, and collagen. A need for specific counter-ions for obtaining or extending the periodicity is demonstrated. Microscopy of dried samples shows crystal arrays including DNA tetrahedra. With optimum periodicity of the liquid crystal, the impedance locus passes through four quadrants of the complex plane. From the capacitive semi-circle in the upper right quadrant, the impedance reverses direction in a counterclockwise manner into all four quadrants at low frequencies (below 8.0 Hz.). The process is first visualized by the inflection to negative DC resistance (-Z'). The equivalent circuit is that of a transmission cable with a negative Randle's sub-circuit. The negative resistance is interpreted as an organized electronic state similar to a diode. The reverse impedance assay is a quantitative technique for extending the study of periodic lattices to complex liquid systems.

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