liquid-crystal transitions

A liquid crystal is a molecular crystal with properties that are both solid- and liquid-like. Liquid crystals are composed predominantly of rod-like or disc-like molecules, that can exhibit one or more different, ordered fluid phases as well as the isotropic fluid; the translational order is wholly or partially destroyed but a considerable degree of orientational order is retained on passing from the crystalline to the liquid phase in a *mesomorphic transition*.

1. Transition to a *nematic phase*.

A mesomorphic transition that occurs when a molecular crystal is heated to form a nematic phase in which the mean direction of the molecules is parallel or antiparallel to an axis known as the director.

2. Transition to a *cholesteric phase*.

A mesomorphic transition that occurs when a molecular crystal is heated to form a cholesteric phase in which there is simply a spiralling of the local orientational order perpendicular to the long axes of the molecules.

3. Transition to a *smectic state*.

A mesomorphic transition that occurs when a molecular crystal is heated to yield a smectic state in which there is a one-dimensional density wave which produces very soft/disordered layers.

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