Growth of liquid crystal domains

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The growth of liquid crystalline phases after a temperature quench from the isotropic liquid phase can be described by universal growth laws of the form $L \sim t^n$, where L is a characteristic length, t the time and n the growth exponent. For increasing quench depth the growth exponent varies from $n=1/2$ to $n=1$, i.e. from a square root to a linear growth behaviour (1,2), independent of the liquid crystalline phase being nematic, cholesteric or smectic. Special attention will be paid to the effects of geometric confinement, such as dimensional crossover from 3D to 2D (3) and micro-confinement in a continuous polymer network (4), on the growth behaviour of liquid crystal phases.

Some unconventional liquid crystals, such as bent-core and hydrogen-bonded systems on the other hand may form rather complex growth domains, which can be described by fractal geometric methods. A comparison between experiment and simulations suggests that such aggregates can be treated as a two-dimensional percolation system at the percolation threshold. It is argued that fractal growth in liquid crystals is a direct consequence of enhanced lateral molecular interactions.

References
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