EXOTIC, THREE DIMENSIONAL MACRO-STRUCTURES IN GELS PRODUCED BY KINETICALLY LIMITED AND GEOMETRICALLY CONSTRAINED COARSENING

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We have recently discovered a rare and elegant coarsening mode in some polyelectrolyte gels that leads to intermediate structures that are complex and beautiful. They were discovered accidentally when a relatively large and thick cylindrical piece of the high density, crosslinked polymer was allowed to swell in water over an extended period. The resulting structure and its time evolution are not easily described in a capsule form. They evolve from monotonous cylindrical shapes in the beginning to periodic, circular, gear-tooth-like structures at short times. At intermediate stages, the elegant three dimensional, orchid-like patterns border on the sensuous. After a long time (of the order of days for length scales of an inch or so), the object is a scaled-up replica of the initial cylindrical structure. Curiously, the intermediate structures, however complex, are quite reproducible in all essential features. The results and our qualitative understanding of this phenomenon will be presented.

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