

7. FRACTALS IN ION CONDUCTING POLYMERS

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The concept of fractals, introduced by Mandelbrot applies to many physical, technological and biological processes. Fractal patterns can be seen in nature, for example, in mountains, clouds, branches of trees, etc. Examples for fractals in physical systems are disordered crystals, electrodeposition of ions, and those formed in ion conducting polymers and composite materials.

There has been considerable interest on the study of fractals. However, experimental fractals (particularly large size fractals) under laboratory controllable conditions are limited in number.

In this experiment the main objective was to grow large size fractals in ion conducting polymers. PEO:NH₄I polymer electrolytes were used to observe the fractal growth. The ionic conductivity and fractal growth of these electrolytes were measured, using samples with different NH₄⁺PEO ratios and different amounts of Al₂O₃.

The growth of clusters in polymer salt complexes can be described by the Diffusion Limited Aggregates model (DLA). Iodine particles form the fractal pattern in the polymer, humidity, and appropriate amounts of Al₂O₃ and salt act as a main role in the fractal growth phenomena.

Fractal growth has also been shown to introduce changes in mechanical, structural and transport properties of the electrolyte.

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