

Structural Features of Cyclodextrin Inclusion Complexes

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Inclusion complexes of α -, β - and γ -cyclodextrins with poly(ethylene glycol)(PEG) and other polymers were prepared using various methods reported so far. The inclusion complexes exhibited the following crystalline features.

1. The inclusion complex of α -cyclodextrin/poly(ethylene glycol) gave a very spotty hexagonal electron diffraction pattern, which gave the hexagonal unit cell. In the case of β -cyclodextrin/ poly(propylene glycol), a spotty hexagonal electron diffraction pattern was also observed. The spotty appearance of these electron diffraction pattern is caused by the following host/guest arrangement: The host cyclodextrin columns are arranged in ordered way, even though guest molecules randomly oriented in the caves of dextrin hosts.

2. The inclusion complex of γ -cyclodextrin with poly(ethylene adipate) gave a "superlattice" comprising 8x8 cyclodextrin units, and additionally its electron diffraction pattern showed the characteristic streaky diffuse scattering due to the attacking fault of the cyclodextrin units.

3. The inclusion complexes contained water molecules in them. The crystal structure was largely disordered, when water molecules were removed by heat treatment. As the original structure was recovered by exposing water vapor, the structural order/disorder transition occurs reversibly.

Keywords: cyclodextrin, superlattice, electron diffraction