

카이랄 키토산 고분자의 표면 방향 분포 연구

Surface orientational distributions of chiral chitosan-polymer

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We have determined the orientational distribution functions (ODFs) at both air and substrate isotropic interfaces of a chiral chitosan bio-polymer film by the measurements of surface second-harmonic generation (SHG). It was shown that the simultaneous SHG analysis of both interfaces, based on the macroscopic and microscopic relations, provides all the informations on the nonlinear optical (NLO) activity.

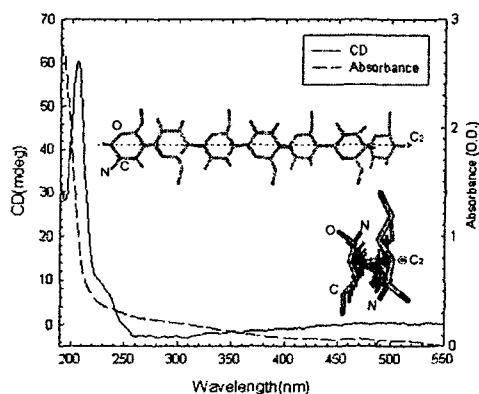


Fig. 1: The linear absorption spectrum and circular dichroism(CD) are shown with the molecular structure of a chitosan polymer possessing the C_2 symmetry axis.

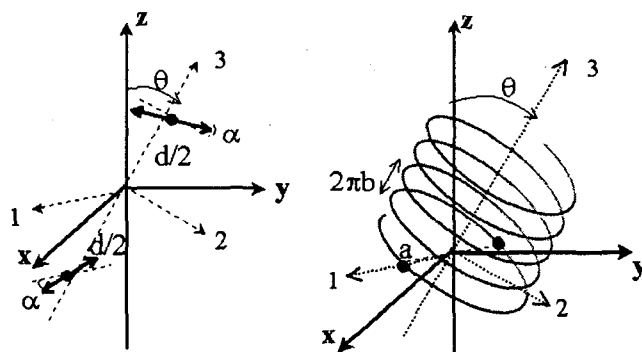


Fig. 2: Two classical microscopic models of chirality to surface SHG : a coupled oscillator and a helix.

By adopting a classical model for chirality, a coupled-oscillator and a helix, and theoretically

fitting the SHG data, we unambiguously determined all of the NLO components at the both interfaces. The largest chiral component is electric-magnetic coupling, indicating that the chiral NLO activity mainly originates from the helix nature of the chitosan bio-polymer. Moreover, unbiased ODF's of the rigid helical chitosan were also determined by maximum entropy method. From the ODF's, it was found that the chitosan at the air interface are more highly polar ordered than those at the substrate interface. These results show the interest of surface SHG to access information about the surface distribution as well as the microscopic origin of NLO activity in chiral bio-polymers.

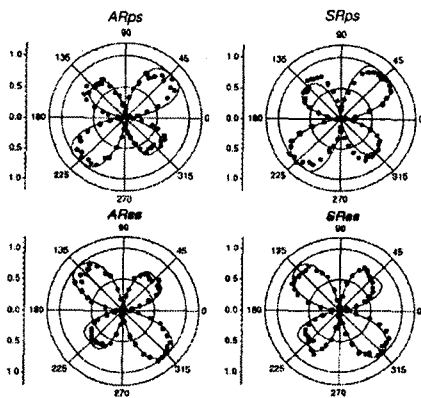


Fig. 3: Surface SHG intensities from the chitosan film as a function of the rotation angle for the $ARps$, $ARss$, $SRps$, and $SRss$ configurations. The least-squared-fit results are shown by solid curves. Closed circles show the independent data sets of each interface.

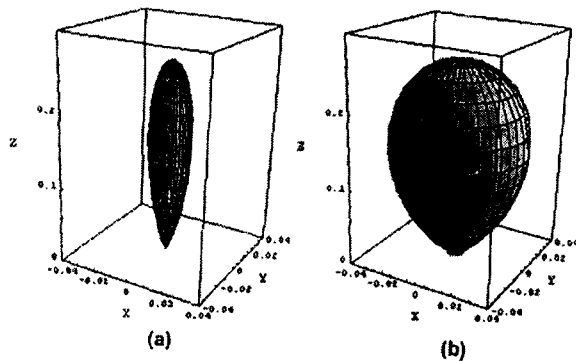


Fig. 4: The ODFs of the chitosan polymers: (a)the distribution f_a at the air-film interface and (b)the distribution f_s at the film-substrate interface.

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