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Holographic interferometry of electron transport in the RC of purple bacteria with the phase portrait for two detergents

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The reaction centers (RC) Rb. sphaeroides R-26 which were isolated from the membrane using two different detergents – sodium cholate (ionic detergent) and Triton X-100 (nonionic surfactant) – were investigated. These detergents have different effects on the stabilization of the RC. The dynamics of the absorption spectra of the RC solution irradiated at a wavelength of 865 nm was measured at the same wavelength.

Initially after the interferogram detection interference fringes cover images of both sides of the cuvette without relative displacement. Upon further illumination relative shift of the interference fringes between the two parts of the cuvette is observed. For the interference fringes belonging to the cuvette part with the RC solution a downward shift is observed. Such direction of the shift corresponds to an increase of the optical density of the RC solution. For the RC with sodium cholate the shift is about 0.1 of bandwidth and for the RC with Triton X-100 the shift is about 0.05 of bandwidth. The RC with Triton X-100 has a smaller characteristic time of the refractive index change than the RC with sodium cholate. In the RC with sodium cholat electron transport recovery slower than in the RC which was obtained with Triton X-100. Therefore, upon exposure the quantitative agreement of the absorption spectra recovery kinetics with the refractive index change for both types of the RCs is observer. Slow kinetics of the RC absorption spectra is associated with structural changes of the RC. The phase porter construction can improve the sensitivity of holographic interferometry and go from the intensity distribution of the interference pattern to its phase characteristics.