Abstract

Mechanisms of the disk formation in Be stars may differ from one Be star to another, which may result in the variations in the circumstellar disk's spectral characters. The mechanism of disk formation is still under debate for the case of binary stars in which a mass transfer could not happened. δ-Scorpii, the target star in this study, is one of the bright Be binary stars that has been classified as a Be star since 1990s when the star shows a weak Balmer emission line. This thesis mainly presents the spectral characteristics in optical region from the year of 2007 to 2011 in order to study the Be characteristics of this type of star. Over 350 spectra of data have been used for this work. The circumstellar regions of H_α, H_β, H_γ, and *HeI* λ6678 and photospheric region which are represented by *HeI* λ4388, *HeII* λ4686, *MgII* λ4481 and *HeI* λ4921 have been used in the investigation of the Be disk of δ-Scorpii. We found that the size of the Be disk of the star particularly, H_α, was varies with V/R ratio that larger disc size correspond to smaller V/R ratio. The long term *V/R* variation of δ-Sco in H_α line shows that the rotation of the circumstellar disk around the primary is following the one-armed oscillation disk model in a prograde direction. All the circumstellar lines used in this study were found correlated mostly in the same manner: their strength were found decreasing from 2007 to the end of 2010 but increased in 2011 as this star approaches the periastron; the lines were shifted toward the longer wavelength for V>R and vice-versa except during the periastron where the disc is rotating faster. The H_α and H_β lines were used in the investigation during the recent periastron and we found that the strength of both lines was largely increased. The high eccentricity of this binary leads the close encounter or periastron that could be significant for the mechanisms of the disk formation. In the second part of this work which studies the evolutionary status of this star, we found that this binary which had the orbital period of 10.817 years was

unable to perform a mass transfer. Our evolutionary model generated using EV stellar evolution code showed that the star is rotating at ~0.5 of critical velocity, ν_{cr}, lower than the rotation which was suggested for the Be phenomenon to happen i.e $0.7\nu_{cr}$. Even with the slower rotation, the relative intensity of the H_{α} emission line still shows about double increment during the 2011 periastron passage compared to the last periastron passage in 2000. It shows that the close encounter of the 8 $M_{\odot}$ companion has a high influence on the appearance and survival of the Be phenomenon of δ-Sco.