CHAPTER 5 CONCLUSION

The thermal stability of less than 2 nm ta-DLC films was investigated in this study by subjecting the films to various thermal annealing conditions. It was found that Raman G and D peaks shifted to higher wavenumber, FWHM of G peak has decreased, and the I_D/I_G has increased after annealing. All Raman observations of the effects of annealing on ta-DLC were not due to transformation of sp^3 to sp^2. In addition, multiwavelength Raman spectra confirmed that there was no sp^3 to sp^2 conversion. Observed temperature dependency can be explained due to more sp^2 clustering.

All changes as observed by Raman can be correlated to the corrosion resistance of the film. The increase in sp^2 clustering size is seen as a weak point in the overall DLC structure which subsequently allowed the acid to penetrate the film structure.

XPS spectra indicated there is a significant O_2 diffusion into ta-DLC films and adhesion layer. This could affect the optical property of DLC film causing it to absorb more light after annealing as captured by the ellipsometer-measured n and k values. Wear depth measurements performed by nanoindenter also shows more wear depth after films have been heated.

However, the film density was still in the range of ta-DLC and there is no change in term of surface roughness after annealing.