CHAPTER V
CONCLUSIONS

5.1 Effect of molar ratios of TiO_2 to AC

In summary, the major findings include;

- TiO_2/AC composite delayed the phase transformation from anatase to rutile phase in TiO_2.
- TiO_2/AC composite in the molar of 1:10 is the best catalyst for photocatalysis process.
- In the comparison of adsorption process, the efficiency of materials can be ordered as $TiO_2/AC/N_2 > TiO_2/N_2 > TiO_2/O_2$.
- Adsorption of 2-CP onto TiO_2/O_2 composite followed the Langmuir adsorption isotherm rather than the Freundlich adsorption isotherm.
- Adsorption of 2-CP onto $TiO_2/AC/N_2$ and TiO_2/N_2 composite followed the Freundlich adsorption isotherm rather than the Langmuir adsorption isotherm.
- In the 2-CP removal efficiency by irradiation process, the efficiency of materials can be ordered as $TiO_2/AC/N_2 \cong TiO_2/N_2 > TiO_2/O_2 \cong TiO_2$/P-25.
- In the determination of kinetic values by Langmuir- Hinshelwood model, all materials have insignificant difference in k_c value. The 2-CP removal efficiency depends on $K_{2\text{-}CP}$ value, which can be ordered as $TiO_2/AC/N_2 > TiO_2/N_2 > TiO_2/O_2 > TiO_2$/P-25.

5.2 Effect of different calcinations temperature of TiO_2/N_2, $TiO_2/AC/N_2$, and AC/N_2 composite

In summary, the major findings include.

- TiO_2/AC composite in the molar ratio of $TiO_2/AC/N_2$ and TiO_2/N_2 delayed the phase transformation from anatase to rutile phase from 1100°C-1300°C.
- Photocatalytic reduction of 2-CP using TiO_2/N_2 and $TiO_2/AC/N_2$ composite followed the pseudo first-order kinetic pattern. The k_{obs} constant of TiO_2/N_2 and $TiO_2/AC/N_2$ in 500°C as calcinations temperature found to be 0.0149

and 0.0143 and the percentage of removal about 92.72 and 91.79, respectively.

5.3 Mineralization of 2-CP using $TiO_2/AC/N_2$ and TiO_2/N_2, composite

- In identifying 2-CP intermediate by TOC and GC/MS, there was no intermediate detected during the photocatalysis process using TiO_2/N_2 and $TiO_2/AC/N_2$. The 2-CP degradation using both materials tends to be a complete mineralization.

5.4 Outcomes from this research

- Obtain the new material, TiO_2/AC, for adsorption and photocatalysis process.
- Obtain the adsorption behavior of $TiO_2/AC/N_2$ and TiO_2/N_2
- Obtain the kinetic information during irradiation of 2-CP using $TiO_2/AC/N_2$ and TiO_2/N_2
- Obtain the performance in 2-CP degradation.

From the above knowledge, the proper nanocrystal TiO_2/AC composite can be synthesized and used for application in organic contaminants as presented in this work. The synthesized TiO_2/AC composite ($TiO_2/AC/N_2$ and TiO_2/N_2) nanoparticle were tested and they successfully removed 2-chlorophenol from synthetic wastewater.

5.5 Further research suggestions

- Developing a new type of TiO_2/AC composite with specific properties such as natural based AC.
- Investigating possibilities in applying this synthesized TiO_2/AC composite for heavy metal removal
- Applications of this synthesized TiO_2/AC composite for cleaning air pollution.
- Applications of this synthesized TiO_2/AC composite for soil remediation.