

## CHAPTER V

### CONCLUSIONS AND SUGGESTIONS

#### 5.1 Conclusion

According to the results and discussion of this research, it can be concluded that:

1. Recovery of ammonium is affected significantly by pH levels. Recovery at pH 7 – 8 ranges between 1% and 2% for both solutions. It then increases slightly at pH 8.5 with 4% (wastewater solution) and 10% (wastewater + seawater solution). The recovery then increases significantly at pH 9 – 9.5, which ranges between 36 – 60%. Volatilization occurs at pH 10, resulting in ammonium recovery reaching 85% and 83% for each solution, respectively, this value however, reflects the amount of ammonium removed from the solution.
2. The lowest phosphate recovery occurs at pH 7 and 7.5. It is then increased significantly at pH 8 – 9.5, with its peak reaching 99% recovery. At pH 10, it decreases slightly to 72% for the wastewater solution and 90% for the wastewater + seawater solution. This indicates that phosphate removal through struvite precipitation is strongly favored under alkaline conditions.
3. The addition of seawater causes an increase in magnesium concentration in the solution, altering the supersaturation condition in the solution and increasing its overall turbidity level. The analysis result also confirms that seawater can be effectively used as an alternative for a magnesium source in the recovery of ammonium and phosphate through struvite precipitation.
4. Wastewater solution produces the highest amounts of crystals at pH level 9, with 16.4 mg at pH 9. Whereas the solution with seawater addition has the highest crystal production of 22.54 g at pH 9.5.
5. Results indicated that at pH neutral (7 and 7.5), recovery of ammonium and phosphate is at its lowest and crystal production at its minimum. An optimum recovery is achieved at pH 8 – 9.5. Meanwhile, recovery in the form of struvite crystals declines when reaching pH 10.

## 5.2 Suggestion

According to the research that has been conducted, suggestions that can be given are as follows:

1. A further research method is required to remove the excess ammonium in the filtrate solution.
2. Further study could also be performed by doing a preliminary treatment on seawater and observing its effects on ammonium and phosphate recovery.

