CONCLUSIONS
5.0. CONCLUSIONS

The objectives of this research were to quantitatively recover nickel from the spent nickel catalyst under modest conditions and to reclaim the recovered nickel by wet-reduction yielding catalyst of desirable hydrogenation activity. Accordingly, the experiments were systematically planned and conducted. The results of this study quite fulfilled the aforesaid objectives of this research. However, there were some other interesting findings which were observed during the course of the present research work which are summarised below:

1. Besides the importance of hydrogen-ion concentration in the extraction of nickel from the spent catalyst, the counter-ions of inorganic acids also contribute significantly to the recovery of nickel through acid extraction of the spent catalyst. When a mixture of acids is employed for digestion, a synergistic effect of the counter-ions provide greater recoveries of nickel for the same hydrogen-ion concentration. A digestive acid mixture of HCl + HNO₃, particularly in 3:1 proportion (v/v), provide better recoveries of nickel from the spent catalyst than that provided by mixtures of HCl + H₂SO₄ and HNO₃ + H₂SO₄ as well as by the individual acids.
2. There is no pH at which iron from the acid extracts of the spent nickel catalyst could be completely removed without any loss of nickel in the ferric hydroxide precipitate. At best about 99% of the iron can be precipitated out at pH 6.0 with about 4.5% losses of nickel.

3. The substrate and the support of choice for preparation of active nickel catalyst by wet-reduction are nickel formate and kieselguhr, respectively. The reduction of nickel formate on kieselguhr support in oil provides catalyst of greater hydrogenation activity than the unsupported wet-reduced nickel catalyst.

Although the objectives of this research are fulfilled, more research is required to improve the techno-economic feasibility of the process for reclamation of the spent nickel catalyst. This can perhaps be achieved by a biphasic extraction of spent nickel catalyst for simultaneous recovery of its fat as well as nickel. The indicated direction of further research stems from the results of some of the experiments carried out during this research where a large volume of solvent or excess of sodium hydroxide was required for the recovery of fat and large excess to stoichiometric requirements of acid was required for the quantitative recovery of nickel from the spent catalyst.