Chapter 6

Conclusion

The following major conclusions are drawn from this study:

1. The Young's modulus of the test composite increased with increasing the calcined bone ash content, while the tensile strength, strain to failure, energy to failure and toughness decreased over the same range. There is a trend of the Young's modulus and tensile strength increase slightly with decreasing particle size of the filler, whereas the strain to failure decreased.

2. At high strain rate, the Young's modulus values of the composite were higher than the low one but the data of the relative Young's modulus contradicted to them.

3. Various models proposed for particulate, two phase materials have been examined for fit to the observed mechanical properties of the calcined bone ash reinforced polyethylene composites. This information is worthwhile when considering processing trade-off. Nevertheless, in some properties, it is difficult to predict because of the particle size, nature of interface and the strength of the adhesion between the phases.

4. The microhardness of calcined bone ash reinforced polyethylene composite increased with increasing volume fraction of calcined bone ash particles and then it is a good predictor for Young's modulus of the composite, over the range of tested here.

5. Fractography studies of the composite revealed that the plastic deformation was strongly influenced by the amount of calcined bone ash volume fraction, leading to a transition from ductile to brittle mode. Crazing or dewetting was seen more clearly by SEM technique. There was not agglomerate of filler in tested composite, being simple dispersion.

Future work

The research continued several implications for future study of

1. The particle size distribution of calcined bone ash particles in composites should be evaluated by using image analyzer and scanning electron microscope.

2. The analogy may be further extended by the development of anisotropy by using elongated particles or platelets of hydroxyapatite and by orientation during moulding.

3. The mechanical properties of calcined bone ash reinforced polyethylene should be investigated at body temperature and environment.

4. Compare mechanical properties of calcined bone ash reinforced polyethylene between injection and compression moulding or other proper methods.

5. Creep and stress relaxation experiments should be performed for this composite.

6. Interfacial phenomena and shear strength developed at the bone-implant interface should be studied by *in vivo* evaluation.

7. New investigations should be aspired to produce tougher composites by using coupling agents to improve adhesion of the filler and matrix or by employing other non-toxic polymers.