

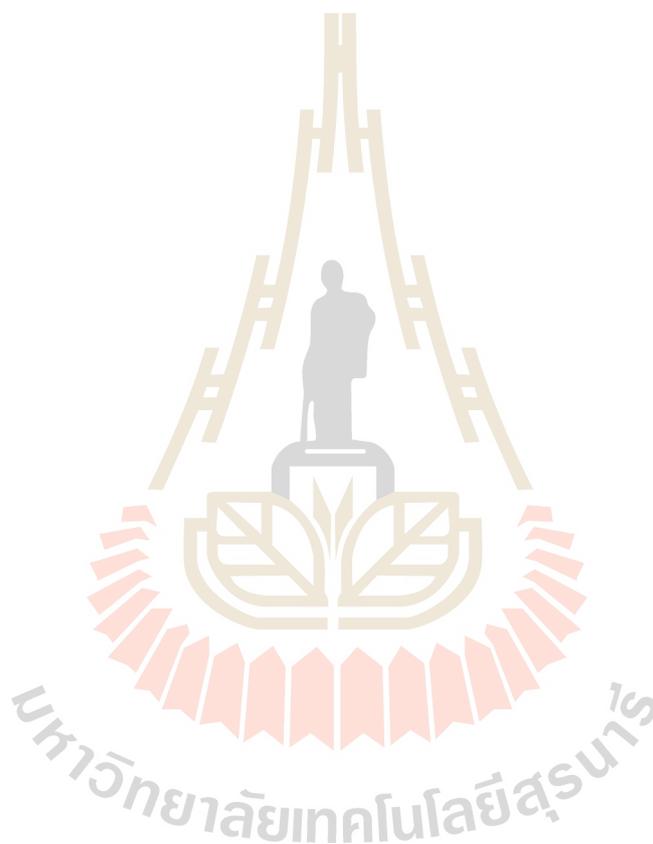
ARUNMANAI LEPON : EFFECT OF GRAPHITE ADDITION ON
MECHANICAL PROPERTIES OF UHMWPE FOR USE AS TIBIA INSERT
BIOCOMPOSITE MATERIALS. THESIS ADVISOR : ASST. PROF.
SUKASEM WATCHARAMAISAKUL, Ph.D., 105 PP.

BIOCOMPATIBILITY / FRICTION COEFFICIENT / GRAPHITE / ULTRA HIGH
MOLECULAR WEIGHT POLYETHYLENE (UHMWPE) / WEAR RESISTANT

This thesis is aimed to study the effect of graphite addition on mechanical properties of Ultra High Molecular Weight Polyethylene (UHMWPE) for use as Tibia insert biocomposite materials. UHMWPE is saluted to be an orthopedic replacement material for use as a knee spacer due to its excellent strength and toughness. Nevertheless, the drawback of UHMWPE in long-term performance is low wear resistant because of the friction between the tibia insert and femoral component with the tibia component.

Therefore, the improvement of wear properties by addition of graphite has been carried out on the UHMWPE. Graphite is an excellent solid lubricant and also exhibits good biocompatibility with human body. The preparation of UHMWPE/Graphite composites is performed by mixing graphite particles in the ratios of 5, 10, 20, 30 and 40 wt% into UHMWPE using dry-mixing method. The mixtures are compressed in a mold under a pressure of 10 MPa, at 250 °C for 30 minutes. Hardness, wear resistant, impact strength, compressive strength and coefficient of friction of the UHMWPE/Graphite composites are examined. The results reveal that the UHMWPE/Graphite biocomposites exhibit a remarkable

reducing in coefficient of friction, which is useful for using as a lubricant in knee replacement material. However, an increase in the graphite ratios reduces the mechanical properties; hardness, impact strength, wear resistant and compressive strength. The composite sample with 40 wt% graphite is very fragile and therefore the composite UHMWPE with the graphite higher than 30 wt% is hard to be formed.



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