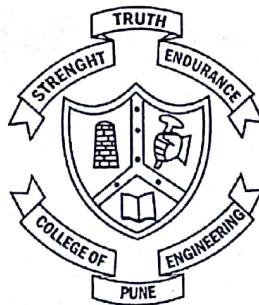


A
Project Report
On
**“Study of Cost Effective Polymeric Nanocomposites Containing Hydroxyapatite
Nanoparticles”**

Submitted in partial fulfillment of the requirement of the degree of
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(Process Metallurgy)

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ABSTRACT

Ultra high molecular weight polyethylene (UHMWPE) is a semi-crystalline thermoplastic polymer which has glass transition temperature and melting point temperature -120°C and 135°C , respectively. In project work, jar ball milling was used for mixing UHMWPE and nano hydroxyapatite powder followed by hot compaction press for making pure and nanocomposites samples. UHMWPE/HA nanocomposites fabricated using hot compaction at 7 MPa pressure and 230°C temperature for 30 mins of dwell period. Density of the nanocomposites was experimentally found and then compared with theoretically calculated values. Density of nanocomposites increased with increase in the addition of HA. Microhardness of the composites was determined and compared with the theoretically calculated values by using ROM and mROM. Vicker's Hardness increased from 4.2 kg/mm^2 to 4.9 kg/mm^2 . SEM micrographs and TEM images revealed the dispersion of HA in UHMWPE matrix and HA nanoparticle size was in range of 20-80 nm and shape was needle like, respectively. X-Ray Diffractogram peaks confirmed presence of HA in UHMWPE matrix. TGA and DSC revealed increased thermal stability and unaffected decomposition temperatures respectively. Further dynamic mechanical analyser (DMA) used to determine elastic modulus, loss modulus and glass transition temperature. Storage modulus and loss modulus goes on increasing with increase in HA nano powder content. Storage modulus increases from 739 MPa to 979 MPa at body temperature (37°C) for 15 wt% HA nanocomposite. Also loss modulus increase from 62 MPa to 83 MPa at body temperature (37°C) for 15 wt% HA nanocomposite. Negligible change in glass transition temperature (T_g).