Effect Of Mineral Content In The Mechanical Properties Of The Bone At The Macro-Micro Scale

Name / NRP : Widya Emilia Primaningtyas / 2712201001
Department : Materials and Metallurgical Engineering
Supervisors : Prof. Marie-Christine HO BA THO, Dr. Sungging Pintowantoro, S.T.,M.T.

ABSTRACT

Bone is the composite material as the major constituent component of body. It lose their strength with the age, it caused from the loss of bone’s mineral content resulting an increased risk of bone fracture. Thus, several challenges arise to build modeling in order to create and predict mechanical properties and bone characteristic or artificial bone scaffolds to decrease the crack bone risk in pathological conditions. To answer these challenges, studied the structure and mechanical properties of bovine cortical bone in the volumic demineralization process using 0.6 M Hydrochloric Acid within 2, 6, 12, and 24h immersion times at Macro-Micro scales. Density measurement and ultrasound test were being performed as at the macro-scale Characterization were done to measure density, modulus, and constanta of elasticity of the sample. Nano Indentation testing was done as a characterization at the micro-scale, to measure the elastic modulus and hardness samples in micro-scale. Then, Nano Indentation experimental data were fitted with a mechanical model Elastic-Viscoelastic-Plastic-Viscoplastic (EVEPVP) to provide a variation time dependent mechanical response of the sample. Through experiments deduced the results indicated that there was a density and modulus of elasticity decrease progresively with the variance of immersion time in the macro scale. In addition, in the micro scale demineralized bone decrease their mechanical properties directly in short time demineralization process and they have a tendency to have the same mechanical properties in the variation time immersion of demineralization process, or we can say that the mineral content of the bone is responsible to the anisotropy behavior of bone.

Key Word : Bone Demineralization, Mechanical Properties, Nano Indentation, Ultrasound test.
halaman ini sengaja dikosongkan