UNDERSTANDING THE BIOMATERIAL'S MICROSTRUCTURE AND MECHANICAL PROPERTIES IN SMALL SCALE USING NANOINDENTATION AND ADVANCED ATOMIC FORCE MICROSCOPE BASED TECHNIQUES

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Abstract: The quantitative measurement of mechanical properties of biomaterial, typically wood based material, using nanoindentation technique and atomic force microscope was presented in this work. The high spatial resolution of the NI system enables a small size, non-destructive test performed on the surface of target material. In particular, wood, straw, crop, switch grass's cell walls, serve as representing lignocellulosic materials, were explored aimed at better understanding the structure, physical and mechanical properties, chemical composition and so forth. Further investigation was carried out to detect the influence of adhesive diffusion in to cell walls. Both quasi-static and dynamic indentations were used to study the properties of interface between wood and adhesives. The essential function of couple agent, such as maleic anhydride grafted polypropylene (MAPP), worked in the natural fiber reinforced composites has been addressed and explained using contacted resonance force microscope. The width of interphase, which is as small as 30nm in Natural fiber-reinforced polymer composites (NFRPC) was successfully measured. It was proved that chemical modification of either fiber or polymer results to a wider interphase and higher mechanical properties of NFRPC. The primary contribution of our work is to build a bridge between macro worlds which associated with most of conventional industry to the micro world, which could essentially explain the science behind phenomena.