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Elemental Analysis of Fish Scale-derived Bio Hydroxyapatite/Collagen Using SEM/EDS

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Biomass is the term for organic materials found in the biosphere. Industrial activities, municipal waste, and land clearance operations are the major sources of producing large scale biomass. The most frequent agricultural biomass wastes are crop stalks, leaves, roots, fruit peels, and seed/nut shells. Whereas most common animal biomass are feathers, bones, scales, skin etc. These readily available natural biobased resources end up in landfills and aquatic bodies, posing environmental and health problems. To maintain a healthy ecosystem, waste must be successfully and sustainably transformed into useful materials. Recently researchers have discovered biochar applications in the domains of composite reinforcement, additive manufacturing, energy storage, and tissue engineering. [1-4]

Biomaterials are being used more effectively, which is a huge step forward in the creation and design of environmentally friendly products. Because of their availability, environmental friendliness, biocompatibility, biodegradability, and cost-effectiveness, natural biomaterials have sparked a lot of interest. The addition of bio filler to a polymer matrix could improve the overall properties of bio composites. Rice husk, starch, eggshell powder, wood flour, fly ash, sea shells, and fish scales have all been studied as naturally accessible fillers. Biomaterials derived from sustainable biomass can be effectively utilized as reinforcing filler materials for biocompatible polymeric materials. Thus developed composites could be used for developing new materials for scaffold and tissue engineering applications. [5-6]

Fish industry alone generates about 75 million tons of fish waste annually around the world. Fish waste is harmful because it contains pathogenic microbes. Fish scales are natural biomaterials made of collagen and hydroxyapatite, they have highly structured hierarchical microstructures and a composition similar to human hard tissues. This gives them good biocompatibility, degradability and mechanical qualities for tissue engineering applications. Hydroxyapatite (HA) is a viable natural reinforcing material for polymers. It is the main inorganic component of the hard tissue matrix which has a great potential to be used as reinforcing material in biomedical applications. Because of its excellent potential to promote cell development and proliferation, fish scales derived hydroxyapatite has gotten a lot of attention. [7]

Scanning Electron Microscopy is a scientific technique which utilizes a beam of electrons in the electron microscope to scan the surface of the sample in raster pattern allowing imaging the structural morphology of the material with insight into minute details like pore structures, surface roughness, micro chemistry etc., which can be very useful cell growth and cell proliferation. This study investigates the surface morphology of biomaterials derived from Carpa and Pink Perch fish scales. Joel JSM-7200F was utilized for performing the SEM microscopy studies. [8]

It was found that that microscale biomaterials with a rough surface morphology and porous structures were present on the both the fish scale powders. This morphology can be very helpful for reinforcement, cell attachment and proliferation making them ideal materials for tissue engineering applications.

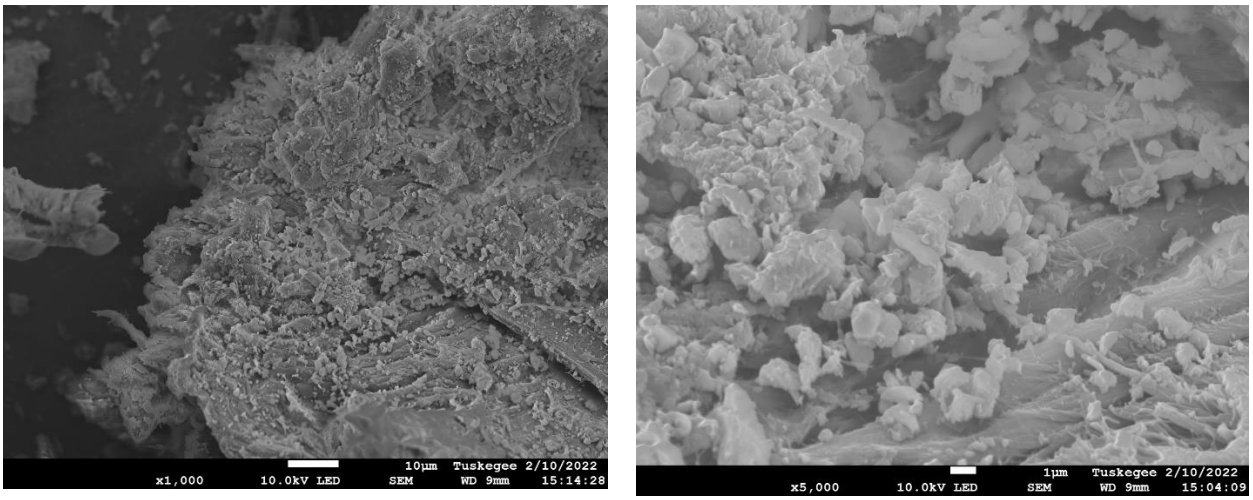

Figure 1. SEM micrographs showing Carpa fish scale powder

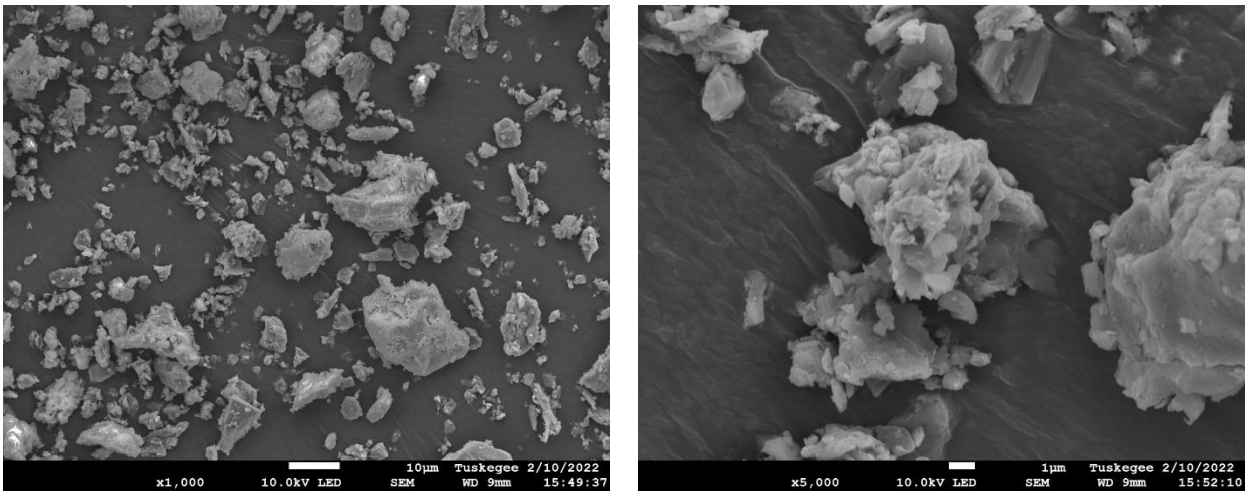

Figure 2. SEM micrographs showing Pink Perch fish scale powder

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