Applications of Microwires and Nanowires in Engineering and Biomedical Regenerative Treatments

Iordan, Ioana (School: Colegiul National "Spiru Haret")

This thesis' purpose was developing applications relevant to engineering & biomedical science through theoretical and experimental study pertaining to micro-&nanowires, propitious materials of quadric-cylindrical structure. The methodology consisted of using key points: analysis of fabrication, processing, properties, and applications. Initially, microwires' ends were stripped of glass insulation using hydrofluoric acid, compound corrosive to glass, harmless to conductive, internal subdomains, thus allowing electric property analysis. Consequently, I developed magnetic connectors allowing electric circuit integration, without damaging the microconductors. Its mechanism consists of superposing magnets, symmetrically distributing magnetic interactions, which fixated one/multiple microwires. Analysis yielded experimental datasets and prospective uses. Hence, microwires were used to develop microsensors for micro-ferromagnetic fluids/objects and microelectromagnetic components. Therefore, multi-purpose capacitive microsensors were developed, including cranial & abdominal investigation and measurement of polymerization or mechanical/thermal medium-expansion. These properties, alongside mechanical and electrical resistances (determined experimentally), facilitated microsensor development resistive-determining tensions, or contact identifying air currents/boundary layers, as well as biomedical applications. Microwire regenerative techniques I proposed are based on similitudes between organic synapses and inorganic models run considering electric & biophysical parameters. Enumerated micro/nanotechnologies including uses pertaining to monetary authenticity and electromagnetic shielding, deem micro-&nanowires fundamental elements in improving industrial & biomedical efficiency.

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