Development of a Zero-Plastic Waste, Cost-Effective, Bio-Degradable, and Eco-Friendly Carbon Ink Pen

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Abstract

Approximately 1100 tons of carbon waste is removed from different sectors in Sri Lanka. This project focuses on a product that features a bio-degradable pen made with wooden material and a carbon ink core, ensuring eco-friendliness. Cedar wood is the most preferred material used for the outer casing of the proposed pen. Dimensions of the created wooden pen are an outer diameter of 7mm, an inner hole diameter of 1.5-2.0mm range, and a length of 143mm. As a novelty, using plastic carbon tubes is prevented during the design, instead a low-thickness UV resin is used which enhances the ink's continuous flow. A hard type UV resin is used as the inner coating because of the shorter curing time and durability, with the purpose of coating and sealing ink from the outer casing. The resin is compressed into the pen hole by a needle. A compressed airflow is fed to the pen hole to facilitate an even spread out of the resin inserted. After 20-25 minutes of drying process, low viscous carbon ink is filled in until it reaches a rate of 95% of a perforated pen hole length according to standards. The weight of the proposed pen will be approximately 4.50-4.80g, in comparison the plastic pen comprises 4.94-6.10g. A weight reduction of approximately 21% has been achieved from the proposed pen. When considering the decay lifetime of the proposed pen, it takes 2 to 3 years to decay without any specific decay treatment method while the existing plastic pen will take 20 to 500 years to decay. In the future implementation, the clip of the pen can be designed using bio-degradable materials, while there is a possibility of splitting the product into two distinguished portions as a pen and a pencil.

Keywords: *bio-degradable, sustainability, wood, eco-friendly, UV resin-coated*