

# Green Synthesis of Boron Doped 3D Printable Microcomposites from Plastic Wastes for Solar and Nuclear Absorption Applications

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Plastic pollution has become one of the most pressing environmental issues in the world due to low-recycling rates. In this study, I developed a general recycling method, Liquid Floating Process or LFP, to apply to many polymer types, through which applicability of sustainable energy storage systems was examined. The process of creating a qualified end-product examined in two stages. In Stage I, with the LFP, boron-doped polymers were produced and collected by electrodeposition. The polymeric structures formed were used to create a 3D printable, rBDPE/B4C micro composite to be used as a solar and nuclear absorbent. LFP will be the first thermocatalic and solvent-free general recycling process in commercial methods with high-yielded, sustainable and cost-effective benefits. In Stage II, micro-unit structures of the boron were used to create a macro level surface by the micro-inspired technique, aiming to increase the surface area per unit volume to be used in smart materials. The microcomposites created were characterized by FT-IR, DSC, and TGA techniques. In addition, qualitative and quantitative examination of cobalt color change test and preliminary titrations were also used in the calculation of the yield. UV-Vis DRS, NAA and UV-Solar Simulator were used in the solar and nuclear absorbent capacity of microcomposites. The performance of the rBDPE/B4C microcomposites in these tests was also an increased neutron attenuation coefficients ( $\mu$ ) in samples and showed the PV effect in the simulator. Economical and theoretical analysis showed that yield for the plastic wastes is 45% higher than the commercial methods. These properties can be exploited in future studies to develop an effective polymeric space-based solar power absorber and energy storage systems.