

*Production of polyhydroxyalkanoates (PHA)-based renewable packaging materials using photonic energy: A bench and pilot-scale study*

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**ABSTRACT:** This work describes the utilization of a new photonic heat treatment technology in combination with polyhydroxyalkanoates (PHA) materials for the development of biofriendly packaging and coated substrate materials. This technology advances the use of aqueous PHA coatings as a replacement for less environmentally friendly extruded plastic and fluorotreated packaging papers and boards. The new technology utilizes short burst photonic energy to heat PHA latex coatings. Utilizing a rapid pulse of photonic energy enables PHA particles to melt and form a film within milliseconds, as compared to conventional equilibrium drying that takes several minutes.

Coatings were applied to commercially produced papers in order to validate the combined use of photonic treatment technology with PHA materials for commercial applications. Photonic treatment for both bench-top and roll-to-roll pilot-scale studies resulted in kit values of 12, and 2 min Cobb values of  $<2\text{g/m}^2$ . Repulpability studies showed the material to be completely repulpable, having 100% accepts after screening. The results demonstrate that the photonic treatment of PHA polymers could be used in current commercial settings to produce environmentally friendly packaging and coated products.