

## **RECYCLED POLYETHYLENE + SILICA FUNCTIONALIZED WOOD COMPOSITES**

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### **ABSTRACT**

Half of all industrial materials used in the United States are wood-based. The increasing demand for good quality wood [1] has resulted in over-logging of non-renewable hardwood and an urgent need to find suitable substitutes. Wood sawdust can provide wood recycling and thus less need for virgin wood - as well as less waste in landfills. We have decided to use wood sawdust as a filler for thermoplastics. An expected additional advantage was cost of the polymer with wood sawdust filler lower than the cost of the polymer alone. The problem was poor interaction between wood and polymer matrix [2]. We had to develop a new strategy for modification of wood fibers to create polymer + wood composites with sufficient toughness, durability and dimensional stability. Namely, we have used colloidal sol-gel silica solution for introduction of silica particles within the wood fiber cells. The nanosilica so introduced we used as sites to attach organic micromolecules and to modify the hydrophilic character of the wood. The composites prepared with sol-gel modified fibers give a superior overall strength and stability relative to other materials. For example, we have achieved 1.5 times higher dimensional stability and a very large elastic modulus increment (512 MPa).

#### References:

1. W. Brostow, T. Datashvili & H. Miller, *J. Mater. Ed.* 2010, **32**, 125.
2. J. George, M. Sreekala & S. Thomas, *Polymer Eng. & Sci.* 2001, **41**, 1471.

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