

SI-ARGET-ATRP GRAFTING OF BLOCK COPOLYMERS WITH AMPHIPHILIC PROPERTIES ON LIGNOCELLULOSIC MATERIALS

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Key Words: Amphiphilic biological material, SI-ARGET-ATRP polymerization, lignocellulosic materials.

Oil is the most significant pollutant in water, since it is released inadvertently from various sources in great quantities. As traditional oil separation methods are plagued with various shortcomings, research for novel membrane materials is ongoing. Wood, as a highly abundant material with a unique anisotropic porous microstructure designed for fluid transport, offers an ideal scaffold for oil-water separation applications. We have recently reported on native wood membranes, which were capable of separating free oil-water mixtures with high efficiency, low oil fouling, and high flux [1]. However, in order to separate oil-in-water emulsions, changes in wood surface wettability through chemical modification are needed.

In order to profit from the natural properties of wood (hierarchical porous structure and biological origin) and to develop smart and innovative materials, a variety of chemical modifications can be used. Cabane et al. have shown that wood can be modified by in-situ grafting of synthetic polymers, enhancing the natural properties of wood and making it competitive with other available materials [2]. We have extended the modification of wood through the grafting of fluorinated methacrylates and quaternary amine methacrylates by surface-initiated ARGET -ATRP (Figure 1A). ATRP is a living polymerization technique allowing for a better control over grafted polymer chain length. The polymer chains are grafted from the wood biopolymers through a two-step reaction. In the first step the ATRP initiator is grafted onto the wood surface (via esterification), and it is used in the second step to grow the polymer chains (Figure 1B).

Through the functionalization of wood with a fluorinated polymer, and following the examples of superhydrophobic surfaces found in nature, we can develop a renewable material, which is both superhydrophobic and oleophilic. Quaternary amine methacrylates increase the natural hydrophilicity and hygroscopicity of the wood. The combination of both polymers should allow for the production of an amphiphilic lignocellulosic material capable of separating oil-in-water emulsions [3].

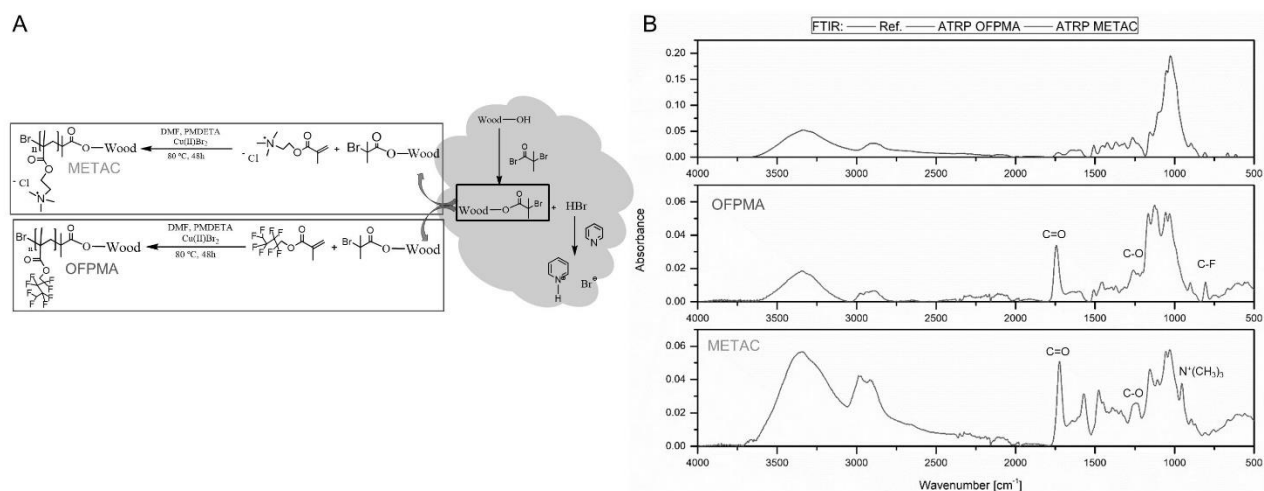


Figure 4—A) Wood modifications scheme for both the fluorinated and quaternary amine methacrylate and B) FTIR spectra of the two polymerizations on the wood surface.

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