LIGNIN-BASED SMART MATERIALS

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Lignin is an important sustainable raw material due to its low price, abundance, and stability. Strategies that can integrate lignin with conventional polymers could offer new materials for generating smart polymers. Smart polymers are materials that designed to have advanced functionality such as self-healing, external stimuli responsive and shape-memory function, which can enable a host of new applications. The next challenge in this field is to develop classes of smart polymers that possess multiple complementary functions. Examples include stimulus-responsive materials that are self-healing and pressure-sensitive adhesives that form the basis for pressure-resist lithography. Numerous approaches to developing these materials will incorporate renewable resources, such as lignin, and leverage advances in polymer chemistry, such as ruthenium metathesis catalysts. Synthetic strategies to develop lignin-based new smart polymers are outlined in the report. In particular self-healing lignin-based nanocomposite elastomer is discussed. The nanocomposite is consist of two important parts: hard core lignin and soft branch polymers. The soft polymer branch has multifunctions of 1) elasticity of the overall composite property and 2) hydrogen bonding segments for the self-healing property. Likewise, both research themes, which are the development of high value-added sustainable raw lignin-based materials and smart polymer development, are synergistic.