# Green Biomass Based Lubricating Material’s Design and Application

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One-third of the world's primary energy is consumed due to friction and wear. As societies transition towards a low-carbon economy, the importance of green lubrication continues to grow. Emphasizing the use of carbon-neutral biological raw materials is crucial for mitigating lubricating oil pollution and safeguarding the environment, providing reliable support for sustainable human development. Lignin, commonly found in waste liquids from the pulp and paper industry and frequently utilized as fuel or for waste treatment, possesses significant advantages such as ample reserves, biodegradability, and natural resistance to oxidation. These qualities make lignin an ideal candidate for green, degradable lubricating additives. However, challenges arise from lignin's structural conformation and group hindrance, limiting its solubility in base oils and thereby hindering its application in green lubrication.

This paper proposes a reciprocal hydrogen bond network strategy to dissolve lignin, which is developed in multi-solvent systems to enhance lignin's solubility. By regulating lignin's structure，the strength of the lubricant film is enhanced, thereby improving interface drag reduction. Additionally, based on lignin's structural characteristics and lubrication applications, standards for lignin (including the number of hydroxyl groups and molecular weight distribution) are established to simultaneously achieve thickening, oxidation resistance, and enhanced wear resistance of lubricating oils. This research leads to the development of a new green lubricant additive, increasing the wear resistance of base oils.

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