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On the Development of Phenol-Formaldehyde Resins Using a New Type of Lignin Extracted from Pine Wood with a Levulinic-Acid Based Solvent

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摘要	Resole resins have many applications, especially for foam production. However, the use of phenol, a key ingredient in resoles, has serious environmental and economic disadvantages. In this work, lignin extracted from pine wood using a "green" solvent, levulinic acid, was used to partially replace the non-sustainable phenol. The physicochemical properties of this novel resin were compared with resins composed of different types of commercial lignins. All resins were optimized to keep their free formaldehyde content below 1 wt%, by carefully adjusting the pH of the mixture. Substitution of phenol with lignin generally increases the viscosity of the resins, which is further increased with the lignin mass fraction. The addition of lignin decreases the kinetics of gelification of the resin. The type and amount of lignin also affect the thermal stability of the resins. It was possible to obtain resins with higher thermal stability than the standard phenol-formaldehyde resins without lignin. This work provides new insights regarding the development of lignin-based resoles as a very promising sustainable alternative to petrol-based resins.
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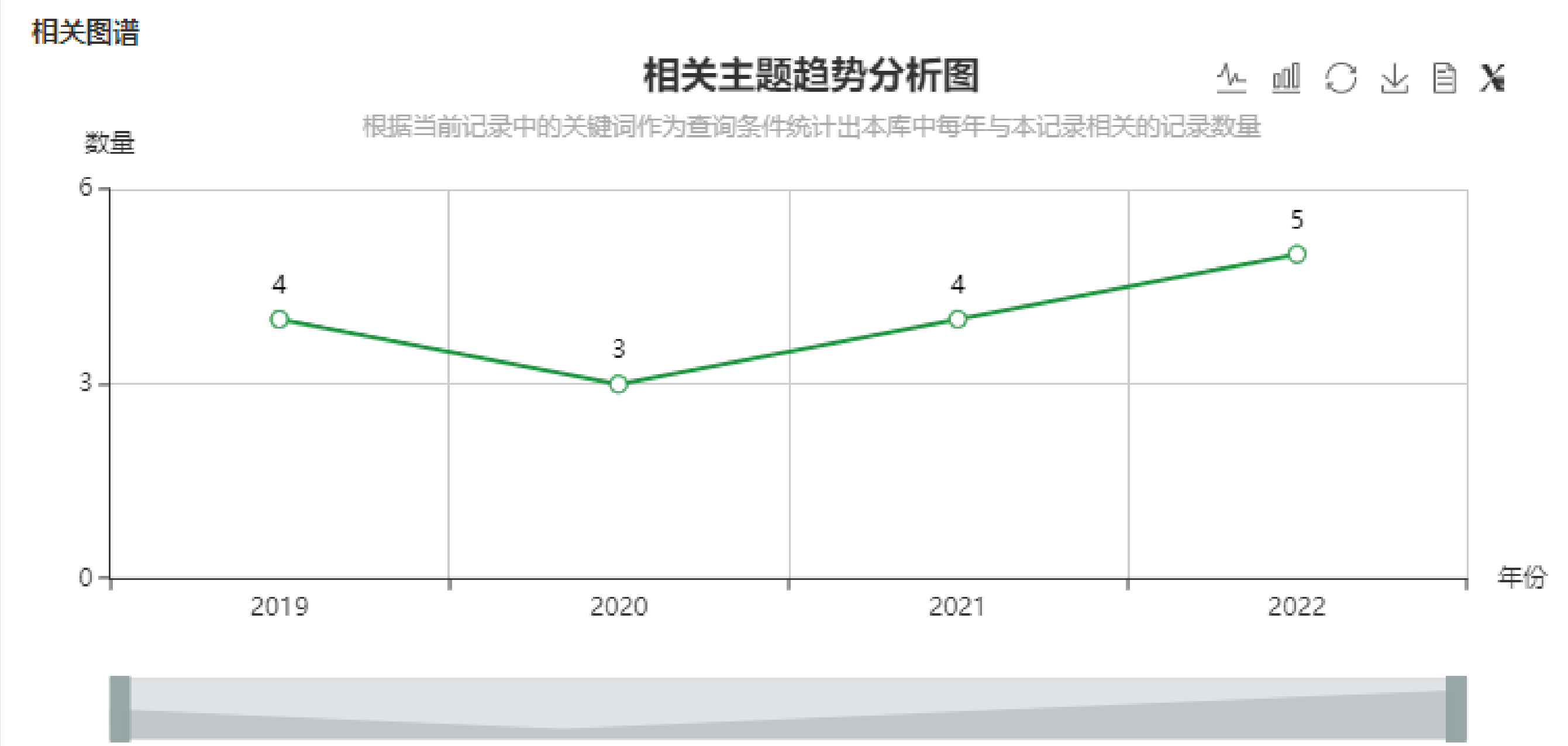
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