ISGC 2022

N°148 / OC
TOPIC(s) : Biomass conversion / Waste and side streams valorization

Synthesis and characterization of lignin nanoparticles

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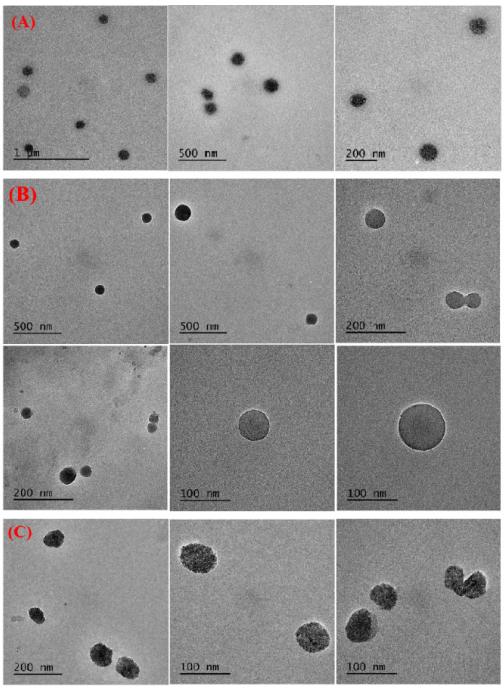
PURPOSE OF THE ABSTRACT

With our continued in-depth understanding of the environmental pollution and resource crisis, the renewable and degradable properties of biomass materials are being increasingly valued [1,2]. As the second most abundant natural polymer material after cellulose, lignin has received extensive attention in recent years [3,4]. The development of bio-based products from lignin is an important part of any comprehensive biorefinery concept because of their biocompatibility and biodegradability [5]. They not only diversify the combination of products and markets, but also benefit waste recycling and economic sustainability [6,7].

Currently, the exploitation of nanolignin is the subject of a tremendous amount of research [8]. Lignin nanoparticles (LNPs) have potential applications in antioxidants, thermal/light stabilizers, reinforced materials and nanomicrocarriers owing to their advantages of non-toxicity, environmental resistance, excellent thermal stability and biocompatibility [9]. In addition, the utilization of economical and environmentally friendly nanolignin as feedstock for the evolution of chemical industry conforms to green chemistry principles and sustainable development concepts [10]. Therefore, the formation of lignin-based nanomaterials will open up a different perspective for expanding the high-value applications of lignin.

In our study, a facile and environmentally friendly approach to the preparation of homogeneous and stable lignin nanospheres is presented. The spherical nanoparticles around 85-125 nm were prepared through the ?-? interactions between molecules in the self-assembly process. Furthermore, the thermal stability of LNPs was significantly enhanced compared to that of lignin. In vitro cell viability evaluation experiments indicated that the prepared nanoparticles had no cytotoxicity and excellent biocompatibility with mouse fibroblast. The high-quality and renewable LNPs will provide a novel perspective for multifunctional and diverse applications of bio-based nanomaterials.

FIGURES



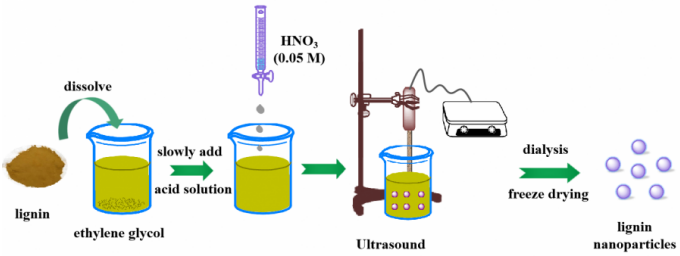


FIGURE 1
TEM images of prepared lignin nanoparticles

FIGURE 2
Synthesis method of lignin nanoparticles
a facile and environmentally friendly approach to the preparation of homogeneous and stable lignin nanospheres is presented

KEYWORDS
lignin nanoparticles | excellent thermal stability | biodegradability | added-value applications

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