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NANOCELLULOSE AEROGEL MATERIALS APPLIED FOR ENVIRONMENTAL TREATMENT

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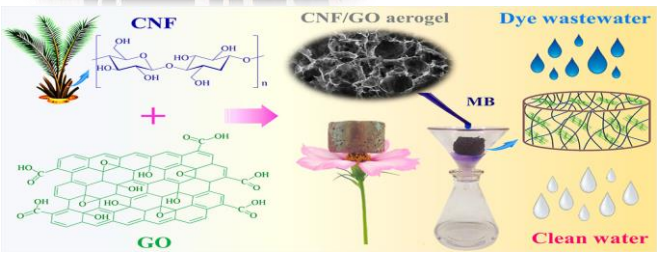
From the by-product source from Vietnamese nipa palm trees, we successfully extracted nanocellulose fibers (CNF) with a diameter of less than 50nm and crystallinity > 75% using a simple mechanical and chemical combination. After being formed, CNF is combined with graphene oxide and a number of additives to create an aerogel by freeze-drying techniques. The resulted material has a high porosity of over 90%, super light and high durability. The aerogel can withstand a load of more than 1000 times its weight. The resulting aerogel shows good adsorption ability on methylene blue (MB) dye and tetracycline antibiotic with a removal efficiency of over 90% and can be reused many times with stable performance.



SUMMARY OF OUTSTANDING ANALYSIS RESULTS ACHIEVED IN THE FORM OF IMAGES & KEY WORDS - CONCLUSION

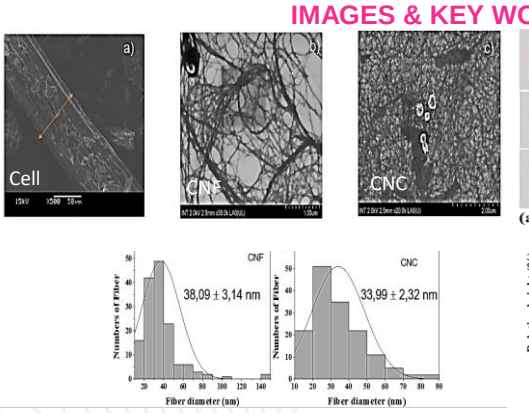


Figure 1: Results of extracting CNF and CNC from by-products of Vietnamese nipa palm trees

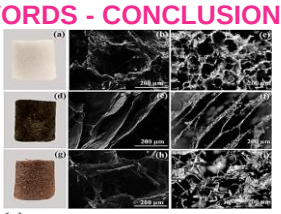


Figure 2

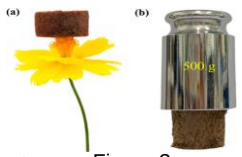


Figure 3

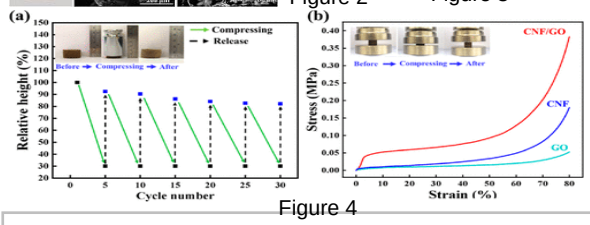


Figure 4

The resulted aerogel has a 3D porous structure (Figure 2), high strength (Figure 3) and good compressive strength (Figure 4) but very light.

Aerogel gives good removal ability on MB and gives reuse efficiency of about 85% after 6 reuses. (Figure 5a-d)The aerogel also exhibits good dye selectivity by only adsorbing cationic dyes (the intensity of the 650 nm region decreases with adsorption time) and does not adsorb anionic dyes (the 480 nm region does not change by adsorption time) shown in Figure 5e.

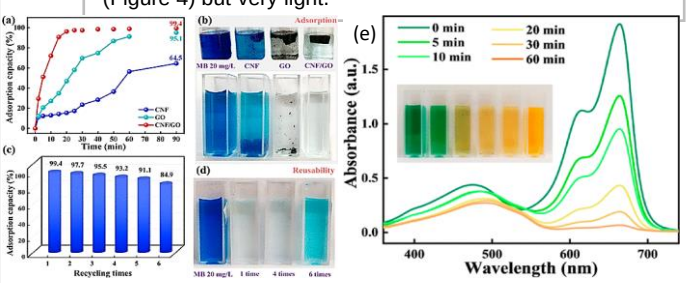


Figure 5: Adsorption capacity of MB dye and selectivity on two cationic (MB) and anionic (MO) dyes of aerogel

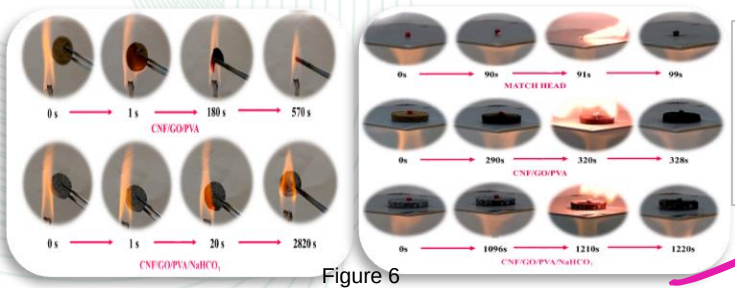


Figure 6

Aerogel after adding the fire retardant additive $NaHCO_3$ increases the ignition time by about 20 times and improves the heat insulation ability by about 3 times (Figure 6).

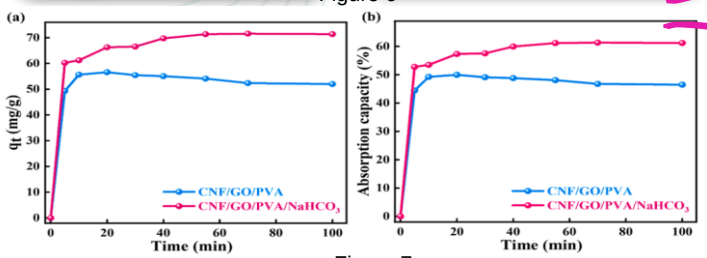


Figure 7

Aerogel with added $NaHCO_3$ also showed good adsorption and removal efficiency for tetracycline antibiotics and had 12% higher adsorption efficiency than original aerogel (Figure 7).

Conclution

Initial results show success in utilizing by-products from Vietnamese nipa palm trees for preparing nanocellulose. This is also the main ingredient in obtaining aerogel with 3D structure, super light, super porous and good adsorption and treatment ability on water contaminated with dyes and antibiotics. In addition, the group's studies also initially showed improvement in the fire and thermal properties of the resulting nanocellulose aerogels through combining with environmentally friendly flame retardant additives such as $NaHCO_3$.

Contact imformation

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