Technical Sessions : A - 06

Sorptive removal of 4-nitroaniline from aqueous solution by using magnetized tea-waste biochar

K M K Wickramaratne[1], M Vithanage[2,3], S R Gunatilake[1]*
[1]*College of Chemical Sciences, Institute of Chemistry Ceylon, Rajagiriya,*
[2]*National Institute of Fundamental Studies, Hantana*
[3]*Office of the Dean, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda*
*email: ranmal@ichemc.edu.lk

4-Nitroaniline (4NA) is a synthetic precursor of pharmaceuticals, fuel additives, corrosion inhibitors, pesticides, antiseptics agents and azo dyes. Residue 4NA has shown adverse effects in aquatic ecosystems. Biochar (BC) is a low cost adsorbent produced by anaerobic thermal degradation of waste biomass known as pyrolysis. Tea-waste is an excellent raw material for BC production in Sri Lanka due to high availability and low cost. Pyrolysis of biomass was done at three different temperatures (300, 500 and 700 ^{0}C) and magnetically modified. Magnetic BC (MBC) were successfully used for the removal of 4NA from water. The FTIR measurements confirmed that the BC produced at low temperatures (LTBC) have high amount of surface functional groups in comparison with BC produced at higher temperatures (HTBC). Maximum adsorptions for both MBA and NBA occurred at mild acidic conditions (pH = 2-4) and HTBC showed higher adsorption capacities than LTBC. Sorption of 4NA onto tea-waste BC were well fitted into both Langmuir and Freundlich isotherm models (R2>0.99). The π^+ - π electron donor acceptor interactions between electron donating arene rings of BC surface and positively charged nitrogen atoms in 4NA can be considered most dominating sorption mechanism at acidic conditions. Increased sorption capacities were observed at higher temperatures indicating endothermic sorption. There were no significant loss in adsorption capacity due to magnetic modification. The magnetic modification allowed easy recovery of sorbent which can be cost effective in industrial applications. Sorption capacities have not been depleted upon magnetic modification.

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Technical Sessions : A - 07

Enapsulation of lemongrass oil in chitosan: formulation and characterization

Y Paragodaarachchi, S Wickramarachchi*
Department of Chemistry, University of Kelaniya, Kelaniya
*email: suranga@kln.ac.lk

Essential oils are gaining increasing interest in food, pharmaceutical and agricultural industries due to their natural and safe status, wide acceptance by consumers, and multidimensional functional properties. This study was carried out to encapsulate lemongrass oil in chitosan to increase its bioavailability. Microencapsulation of lemongrass oil was carried out using ionotropic gelation of chitosan crosslinking with sodium tripolyphosphate (STPP). The effect of varying amount of polymer, crosslinker and oil on encapsulation efficiency (EE), oil content, and release rate were determined. Gas chromatogram of lemongrass oil indicated the presence of Citral-B (34.12%) and Citral-A (44.31%) as the major constituents. According to optical microscopic images, MCs are spherical in shape and their size varies from 38.66 ± 0.46 to 96.33 ± 0.05 μm. Scanning electron microscopic image of the oil loaded capsules further evidence the spherical shape of MC with a smooth surface while empty capsules had a layered structure. The particle size and EE increased with increasing oil load, polymer and crosslinker concentration. High oil load and polymer concentration lowers the efficiency of the dispersion force (1000 rpm) resulting higher particle size. Increasing crosslinker concentration increases the oil retention. When the polymer concentration is high, solution contains excess polymer to encapsulate oil vesicles. All of these contribute to higher EE. However, EE decreases when the viscosity of the solution is too high which result in lower dispersion of oi/water emulsion. EE increases with increasing cross-linker concentration as a compact solid matrix is formed which lead to increased number of formed MCs. After a critical concentration
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value of crosslinker concentration, aggregation of MCs occur. This decreases the EE. It was found that the number density of the capsules increases and the thickness of the wall of capsules decreases with increasing oil load due to the low efficiency of the dispersion force. This increases the release rate. The thickness of the wall of capsules increases with increasing polymer concentration as excess of polymer is present to cover the oil vesicles thus decreasing release rate of the oil from MCs. The release rate also decreased with increasing crosslinker concentration as the microcapsule wall become more compact.

FTIR spectra of oil encapsulated MC and empty MC were more or less the same hence proving successful encapsulation of lemongrass oil in chitosan. The highest EE and release rate was observed at polymer (1 g), oil (3 g) and cross linker (0.5 g) thus concluding the optimum formulation for lemongrass oil loaded MCs.

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Technical Sessions : A - 08

Potential of *Barringtonia asiatica* seed kernel extracts as antifungal agents

Y P Ragutharan[1], M M Weerasekera[2], S Ekanayake[1]*

[1]*Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda.*

[2]*Department of Microbiology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda*

*email: sagarikae@hotmail.com

Candida species are leading opportunistic fungal pathogens causing infections in humans. Development of resistance to existent anti mycotic drugs cause the need for development of new agents against *candida*. Antimicrobial activity has been reported in methanolic extracts of bark and leaves of *Barringtonia asiatica*. Our previous work indicated the presence of phenolic compounds and cytotoxic potential in the methanolic extract of *B. asiatica* seeds. This study aims to assess the potential of antifungal activity of the crude methanolic extract (CME, 15 g powder / 40 ml MeOH; 24 hrs; dried at 45 ^{0}C) and a fraction obtained from CME run through the Medium pressure liquid chromatography (MPLC) using different solvent gradients. CME and a fraction obtained from MPLC were tested for antifungal activity against standard type strains of *Candida albicans* (10231), *Candida tropicalis* (32113), *Candida parapsilosis* (7330), *Candida glabrata* (90030) and their clinical isolates. The antifungal assays were done with CME (1500 ppm) or MPLC fraction (1000 ppm), flucanozol [positive control, 50000 ppm (50 mg / mL)] and dimethyl sulfoxide DMSO (negative control, 5%)) using Mueller Hinton Agar (MHA) medium and the zone of inhibition was measured after incubation at 37 oC for 24 hours. Table 1 shows antifungal activity against selected *Candida* (ATCC) and their clinical isolates. Both CME and MPLC fraction inhibited the growth of ATCC strains except for *C. tropicalis* showed inhibition of growth at lower concentration than flucanozol. All clinical isolates of *C. albicans* and *C. glabrata* were inhibited by CME and MPLC fraction. Expect for one clinical isolate, CME inhibited the growth of C. tropicalis even though CME did not inhibit the ATCC strain. Both CME and MPLC were not active against most of the clinical isolates of *C. parapsilosis* at the given concentration. The isolates MPLC fraction (1000 ppm) indicated significantly high inhibition zones compared with CME in most of the strains and clinical isolates ($p \leq 0.05$) at these concentrations. Seed of *B. asiatica* CME and the MPLC fraction inhibited the growth of tested Candida ATCC strains except for *C. parapsilosis* and clinical isolates of all four Candida strains at a lower concentration when compared with the positive control flucanozol. Therefore, CME and MPLC fraction of *B. asiatica* have a high potential to be developed as an anti fungal agent.
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