



Fractionation and extraction of bio-oil for production of greener fuel and value-added chemicals: Recent advances and future prospects



Yi Herng Chan^{a,*}, Soh Kheang Loh^{b,*}, Bridgid Lai Fui Chin^c, Chung Loong Yiin^d, Bing Shen How^e, Kin Wai Cheah^{f,g}, Mee Kee Wong^a, Adrian Chun Minh Loy^h, Yong Ling Gwee^{f,g}, Shirleen Lee Yuen Lo^e, Suzana Yusup^{f,g}, Su Shiung Lam^{i,j,*}

^a PETRONAS Research Sdn. Bhd. (PRSB), Lot 3288 & 3289, Off Jalan Ayer Itam, Kawasan Institusi Bangi, 43000 Kajang, Selangor, Malaysia

^b Energy and Environmental Unit, Engineering and Processing Division, Malaysian Palm Oil Board, 6 Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia

^c Department of Chemical Engineering, Faculty of Engineering and Science, Curtin University Malaysia, CDT 250, 98009 Miri, Sarawak, Malaysia

^d Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), 94300 Kota Samarahan, Sarawak, Malaysia

^e Research Centre for Sustainable Technologies, Faculty of Engineering, Computing and Science, Swinburne University of Technology, Jalan Simping Tiga, 93350 Kuching, Sarawak, Malaysia

^f Biomass Processing Laboratory, HICoE - Centre for Biofuel and Biochemical Research, Institute of Self-Sustainable Building, Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia

^g Chemical Engineering Department, Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia

^h Department of Chemical Engineering, Monash University, Clayton, Victoria 3800, Australia

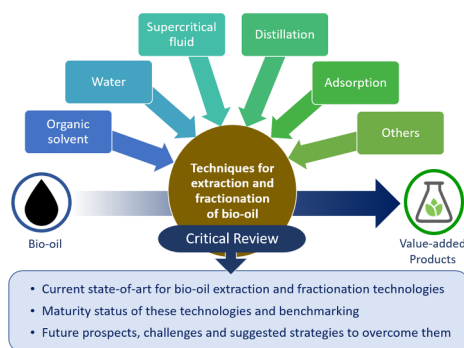
ⁱ Pyrolysis Technology Research Group, Institute of Tropical Aquaculture and Fisheries (Akuatrop), Universiti Malaysia Terengganu, 21030 Kuala Terengganu, Terengganu, Malaysia

^j Henan Province Engineering Research Center for Biomass Value-added Products, School of Forestry, Henan Agricultural University, Zhengzhou, 450002, China

HIGHLIGHTS

- 9 current separation techniques of bio-oil fractionation/extraction are reviewed.
- Extraction efficiency of bio-oil and their potential applications are reviewed.
- Advantages and challenges of each separation technique are identified.
- Bio-oil refining using organic solvent appears to be most promising for up-scaling.
- Oil palm-based bio-oil value chain with conversion technology is promising.

GRAPHICAL ABSTRACT



Abbreviations: AFBO, Aqueous fraction of bio-oil; AP-Ni-MSN, Aminopropyl groups and nickel nanoparticles immobilized in mesoporous silica nanoparticles; b.p, Boiling point; BEZ, Benzene; BTL, Biomass-to-liquid; CC₄, Tetrachloride; CDC, Carbide-derived carbon; CDI, Capacitive deionization; CF, Chloroform; CNFs, Carbon nanofibers; CO, Carbon monoxide; CO₂, Carbon dioxide; CYH, Cyclohexane; DCM, Dichloromethane; DMK, Acetone; EAC, Ethyl acetate; EFB, Empty fruit bunch; FFA, Free fatty acid; GHGs, Greenhouse gases; GWP, Global warming potential; HEX, n-hexane; HHV, Higher heating value; ILs, Ionic liquids; IOC, Iso-octanol; LCA, Life cycle assessment; LG, Levoglucosan; LC, Liquid chromatography; MeOH, Methanol; MF, Microfiltration; MIPS/CAM, Molecularly imprinted polystyrene nanospheres composite alumina membranes; MON, Motor octane number; n-C₁₆, hexadecane; NF, Nanofiltration; NPV, Net present value; PAHs, Polycyclic aromatic hydrocarbons; PDMS/PMMA, Poly(dimethyl siloxane)/Poly(methyl methacrylate); PE, Petroleum ether; PKS, Palm kernel shell; Ra, Hansen solubility distance; RMW, Relative molecular weight; RO, Reverse Osmosis; RON, Research octane number; RPLC, Reversed phase liquid chromatography; sc-CO₂, supercritical carbon dioxide; SFC, Supercritical fluid chromatography; SFE, Supercritical fluid extraction; SDGs, Sustainable Development Goals; TCE, 1,1,1-trichloroethane; TEA, Techno-economic analysis; THF, Tetrahydrofuran; TL, Toluene; UF, Ultrafiltration; VOCs, Volatile organic compounds; W:O, Water-to-oil

* Corresponding authors at: Institute of Tropical Aquaculture and Fisheries, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia and Henan Province Engineering Research Center for Biomass Value-added Products, School of Forestry, Henan Agricultural University, Zhengzhou, 450002, China (S.S. Lam).

E-mail addresses: chan.yiherng@petronas.com.my (Y.H. Chan), lohsk@mpob.gov.my (S.K. Loh), lam@umt.edu.my (S.S. Lam).

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