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Establishing a nano fishpond-algae cellulose industry for generating gelling material for the production of biogel fuel for domestic heating

Ofoegbu Obinna
Federal University of Agriculture, Makurdi, Nigeria

A mixed culture algae community was harvested from a fish pond, dried and its lipid component extracted by microwave assisted extraction (MAE) followed by steam assisted mechanical pressing (SAMP). The residual protein and hemicellulose components were removed by alkali extraction after which mild acidified solution of methanol was used to neutralize the alkali and extract all other left over by-product materials like chlorophyll and sugars. The obtained cellulose material was subjected to preliminary size reduction and subsequent acid hydrolysis to obtain nano-sized cellulose material. The nanocellulose was converted to its acetate and subsequently used as a fuel gelling agent in a bio fuel production process to obtain a gel fuel. With X-ray diffraction (XRD), ultraviolet and visible absorption spectroscopy (UV-VIS) and Fourier infra-red spectroscopy, the nano-sized status and component functional groups were ascertained. The heating and calorific value of the product was also determined and compared with known fuels. The use of the nanocellulose from fish pond algae cellulose in gelling bio fuel in supplementary reduces the overall cost of producing the fuel, thus providing a frugally inexpensive alternative heating material to fossil fuel.

obinnafor@yahoo.co.uk

Environmental risks of the heavy metal pollution of the river ecosystems in the Lake Sevan basin

G Gevorgyan[1, 4], S Khudaverdyan[1], A Vaseashta[2, 3], A Aleksanyan[1,5]
[1]Faculty of Radio Engineering and Communication Systems of Armenian National Polytechnic University, Armenia
[2]Institutes for Advanced Sciences Convergence & Int'l Clean Water, USA
[3]International Clean Water Institute, Molecular Science Research Center, USA
[4]Institute of Hydroecology and Ichthyology of Scientific Center of Zoology and Hydroecology of NAS RA, Armenia
[5]Institute of Botany of NAS RA, Armenia

The Lake Sevan basin is situated in the eastern part of the republic of Armenia (Gegharkunikmarz/province). Being a habitat for endemic fish species, the Lake Sevan basin has been affected by various anthropogenic factors such as domestic, agricultural and industrial activities, etc. It is also necessary to mention that Lake Sevan is the biggest freshwater supply in the Caucasus. That is why the Lake Sevan basin management has always been an important environmental issue for investigators and decision-makers. The heavy metal pollution of the some tributaries of Lake Sevan and related environmental risks were investigated. Water sampling was performed in August and December, 2014 from the 4 observation sites: Sotq river upstream (about 600 meters upstream from the Sotq gold mine) and the mouths of the Sotq, Masrik and Dzknaget rivers. Heavy metal (V, Fe, Ni, Cu, As, Mo, Pb) concentrations in the water samples were determined by the standard methods using an atomic absorption spectrophotometer.Integrated heavy metal pollution degree for the growth of fishes in the rivers was evaluated by Nemerow and Sumitomo's (Nemerow N. L and Sumitomo H., 1970) water pollution index (WPI). Health risks associated with the heavy metal pollution of water were studied via ingestion and dermal routes to recipients based on the USEPA risk assessment methodology. The results of the study showed that heavy metal content mainly increased from the upstream of the Sotq river to the mouth of the Masrik river, which may have been conditioned by the influence of gold mining activity as the Masrik and its tributary - Sotq rivers passing through the gold mining area undergo heavy metal pollution. The activity of the Sotq gold mine in the Lake Sevan basin caused the heavy metal pollution of the Sotq and Masrik rivers which, according to the Nemerow and Sumitomo's WPI values, may have affected the growth of hydrobionts especially impacting fishes negatively.Heavy metal content in the Sotq and Masrik rivers may have posed risks to human health in case of water use for bathing/showering and drinking purposes. The Dzknaget river mouth, which didn't undergo significant heavy metal pollution, were lightly polluted with heavy metals, and after some precautionary measures, it may have been used for different purposes.

gev_gor@mail.ru