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Investigation of Monod and inhibition kinetics during 1-butanol and terpenoids production from CO_2 by *S. elongatus*

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Fossil fuels, including oil, coal and natural gas, are providing about 85% of our energy need worldwide. The main drawback of fossil fuels is that it is a finite resource and will be depleted in the near future. Unlike fossil and nuclear fuels, alternative energy comes from natural resources (wind, sunlight, geothermal power and biomass) which are constantly replaced. Conversion of CO_2 for the synthesis of chemicals by photosynthetic organisms is an attractive target for establishing independence from fossil reserves. Tremendous academic and industrial efforts have been made to produce 1-butanol, which is one major type of biofuel. Oxidised forms of carbon, CO_2, can be used to synthesise energy-rich organic molecules. The terpenoids can be classified into monoterpenes (C10), sesquiterpenes (C15), diterpenes (C20), triterpenes (C30) and tetraterpenes (C40) according to the number of isoprene structures. The thermochemical and thermophysical properties of some monoterpenes, sesquiterpenes and their derivatives make them ideal candidates as 'drop-in' JP-8, gasoline and diesel fuels. In this study, it was studied the direct conversion of CO_2 into reduced fuel compounds with a merit such as 1-butanol and terpenoids (limonene and bisabolene) using a Cyanobacteria namely *S. elongatus* isolated from Guzelyali-Izmir in Agean Sea (Turkey). The productions of 1-butanol and terpenoids (limonene and bisabolene) by *S. elongatus* from CO_2 were investigated. Under optimized conditions (0.5 mg L^{-1} dissolved oxygen, 0.8 mg L^{-1} NO_3-N, 0.5 mg L^{-1} $CaCl_2$) the growth kinetic depending on 1-butanol, bisabolene and limonene concentrations were detected under Monod kinetics. The effects of some environmental conditions on the 1-butanol and terpenoid (limonene and bisabolene) productions were investigated. The substrate accumulation and the low biomass/CO^2 to 1-butanol, limonene and bisabolene yields were investigated with Lineawaever-Burck inhibition kinetics such as, non-competitive and un-competitive.

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Research on power system harmonic detection based on Hadoop MapReduce framework

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Statement of the Problem: The proposal and development of smart grid corresponding brought a large number of inputs of power quality monitoring terminals in the regional power grid. Meanwhile, the increase of sampling frequency and the monitoring time has accelerated the explosion growth of sampling data in the power quality monitoring platform. In the traditional power quality monitoring platform, the monitoring terminal data uploaded and processed by adopting centralized mode. With the advancement of the smart grid construction, higher requirements of computing speed and precision of the power quality monitoring indexes are put forward. The storage capacity and computing ability of the server in traditional power quality monitoring platform can hardly meet the growing demands of operation requirements. Though purchasing a higher configuration server can temporarily meet the demand of computing, it will lead to large waste of resources when there are no running tasks. The purpose of this study is to realize a high efficiency calculation of sampling data of electric power system under low hardware cost and minor resource waste is a problem of research value.

Methodology & Theoretical Orientation: It is possible to make full use of the powerful data storage capacity and computing ability under Hadoop distributed file system and parallel programming model to calculate the basic sampling data in power quality monitoring platform; Based on the study of windowed interpolation theory of Fourier analysis method, a novel kind of improved sidelobe characteristics window function - time domain multiplication window can enhance the accuracy of calculation.

Findings: The harmonic analysis algorithm based on time domain multiplication window is applied to the MapReduce framework of the power quality monitoring platform. The feasibility and superiority of the proposed parallel processing model of the power quality platform are verified through the experiment based on a small Hadoop cluster.

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