Novel photo-fuel cell that absorbs visible light

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Photo-Fuel cells are photoelectrochemical cells that can produce useful forms of energy by photocatalytic degradation of organic wastes. TiO_2 is the most successful photocatalyst but it is burdened with the disadvantage of the absorption by only UVA light. Thus, in the present study there have been efforts for its photo-activation through smaller energy band gap semiconductors that absorb in the visible part of solar spectrum. For TiO_2 sensitization with quantum dots CdS, CdSe the low-cost SILAR method was used and sol-gel solutions were also prepared for its substitution by semiconductors like WO_3 or $BiVO_4$. The quality and efficiency of the cathode plays an equally important role as the performance of the photocatalyst. In this work metal chalcogenides and reduced graphene oxide have been prepared by electrodeposition and spin-coating methods respectively, for their use as counter electrodes. The efficiencies with the combination of the new photocatalysts and counter electrodes reached 8%, under visible light irradiation.

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Effect of bioethanol blending with gasoline on emissions characteristics with spark plug alteration for SI engine

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In recent years, enhancement of engine technology was speeded up due to global environmental issues, rapid depletion of fossil fuel and economical reasons. For this reason, scientists have been carried out many techniques such as dual-fuel utilization and spark ignition (SI) improvement. In this study, above mentioned techniques were implemented in a naturally aspirated, single cylinder, SI test engine and their effect on emissions characteristics was observed. For this purpose, two different spark plugs; copper (conventional) spark plug (CSP) and iridium spark plug (ISP) were used. For each spark plug, two different test fuels were evaluated which are conventional gasoline and 5% bioethanol added gasoline (E5). Experimental results have shown that iridium spark plug leaded to reducing unburned-hydrocarbons (UHC) and carbon monoxide (CO) emissions because of increased combustion quality. Similarly, higher oxygen content of bioethanol helped to increase combustion completeness and thus, HC and CO emissions were diminished because of bioethanol usage.

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Effect of alkaline pretreatment on the characteristics of different parts of corn stalk

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Lignocellulose is resistant to biological or chemical treatments, therefore, pretreatment is a crucial procedure aiming to the improvement of material's structure for the following microbial and enzymatic processes. Each part of the plant has different composition and characteristics, and it is reasonable its behaviour to be different in each treatment. Therefore, in order to achieve more efficient use of biomass, it is necessary to study the biomass from each corn part separately. In the present study the effect of alkaline pretreatment on different parts of corn stalk (stem, flower and cob) was investigated. Porosimetry was performed to investigate the effect on specific surface area, pore volume and pore diameter, while scanning electron microscopy was used to reveal the effect on corn stalk surface. Finally, the effect on lignin content was also evaluated. The results are important and very promising for potential enzymatic hydrolysis of the biomass, improving the accessibility of enzymes to cellulose.

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The study of possibility of using wastewater for cultivation of cyanobacteria – biodiesel

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The cultivation of cyanobacteria on wastewater polluted by organic substances allows to purify it, on the other hand, to obtain biodiesel fuel based on their biomass.

For studying the possibility of using municipal wastewater the collection strain Cyanobacterium sp. IPPAS B-1200-2 was cultivated on wastewater from primary sedimentation tank, aerated tank and from secondary sedimentation tank of wastewater treatment plant of Almaty, Kazakhstan, as a control Zarrouk medium was used. It was detected that dry weight of Cyanobacterium sp. IPPAS B-1200-2 grown on wastewater from primary sedimentation tank, aerated tank and secondary sedimentation tank compose 3.4, 5.6, 3.8 g/l respectively, while dry weight of control is 4.5 g/l. As a result of investigation, it was detected that after cultivation of collection strain of cyanobacteria *Cyanobacterium sp.* IPPAS B-1200-2 on wastewater from secondary settler, water purification made up 86–90%, it indicates the high ability of this strain to bioremediate wastewater.

Thus, it was established that the use of municipal wastewater from the secondary sedimentation tank of the Almaty treatment plant for the cultivation of cyanobacteria would make it possible to