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V Beschkov

Bulgarian Academy of Sciences, Bulgaria

Sustainable energy production from natural water resources by sulfide driven fuel cell

Hydrogen sulfide is frequently present in natural waters, like mineral springs, but mostly it is found in marine water with low renewal rate. The Black Sea is the water pond with extremely high hydrogen sulfide content, estimated to some 4.6 Gt, thus increasing in time. The utilization of this enormous amount could be accomplished in different ways, but the most promising is its direct conversion into electricity. This result can be attained by Sulfide Driven Fuel Cell (SDFC), converting sulfide to sulfate thus releasing up to 26 GJ/t. This work presents experimental data in laboratory scale SDFC for sulfide conversion into sulfate, sulfite and polysulfide releasing different amounts of electric energy. Experiments are carried out at initial sulfide concentrations from 10 to 300 mg/l. Sulfate, sulfite and polysulfide ions are detected in the outlet solutions from the fuel cell. The quantitative results showed good agreement with the chemical analyses. Most of the results showed attained high efficiencies of the fuel cell, i.e. up to 80%. The next efforts will be dedicated to attainment of high current and power densities suitable for direct practical applications. The practical applications of this method could be extended to other purposes, like treatment of polluted water together with utilization as energy.

Biography

V Beschkov, PhD, DSc has got his PhD and DSc degree from the Bulgarian Academy of Sciences. His present interests are chemical and biochemical processes for environment protection and utilization of renewable energy sources. He participated in 30 scientific projects and in 19 applied ones. The most important project he has been working on is "Hydrogen Production from Black Sea Water by Sulfide-Driven Fuel Cell", financed by the FP7. He published over 200 scientific papers, monographs and chapters in selected issues. Over 1300 citations of his papers have been noted (h-index=20).

vbeschkov@yahoo.com

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