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Laser Induced Hydrogen Generation from Coal in Water[1] DOVLETGELDI SEYITLIYEV, DANA BIECHELE-SPEZIALE, BYRON GRANT, KHOMIDKHODZHA KHOLIKOV, ALI ER, Western Kentucky Univ —
We report an alternative way of obtaining hydrogen using nanosecond laser pulses and various ranks of coal and coke. SEM-EDS analysis shows the atomic concentrations of elements on each of the powders which also is in good agreement with calorimeter analysis. Coal and coke powders were irradiated with 1064nm IR and 532 nm green Nd:YAG pulsed laser beam for 45 minutes. The volume of the total gas generated after irradiation of each rank was measured using the water displacement method. The amount of gas generated increased when using 532 nm compared to 1064 nm. Post-irradiation SEM images show structural differences with samples before irradiation. The amount of gas generation with respect to laser energy density shows nonlinear correlation. Generated gas concentrations were then analyzed using gas chromatography (GC). Hydrogen and carbon monoxide were the two most highly generated gases, and the efficiency of each rank of coal was determined by analyzing the hydrogen to carbon monoxide ratio. The highest efficiency rank was anthracite, with hydrogen to carbon monoxide ratio of 1.4. GC analysis also showed that the maximum hydrogen generation occurs at 100 mJ/pulse laser energy. The efficiency of each rank of coal was observed to correlate with carbon content.

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Dovletgeldi Seyitliyev
Western Kentucky Univ

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