

# Essay on of gasification liquefaction pyrolysis and combustion

[Environment](#), [Electricity](#)



## **Compare and Contrast Analysis**

The useful features of coal have been discovered by ancient people.

However, it is widely used in the modern world. Furthermore, its manufacturing and products from coal are important part of economy strength worldwide. Since the time of ancient Greece and Rome coal did not only lose its significance but it had been increased because many new methods and technologies of coal application have been discovered.

One of the methods of coal processing is combustion. Since antiquity it have been used to produce heat and later electricity. Nowadays, the combustion process is most widely used on the coal of fossil-fuel power stations. The mechanism of the electricity generation is not complicated and at the beginning the thermodynamic efficiency of it was low. But it is being increased in the course of time. First, coal is burned in a special tank or furnace, which is connected to a boiler with water inside. The steam generated by the high temperature moves turbines, which turn generators and create electricity. Combustion itself can be divided into fixed bed combustion and fluidized bed combustion (Yongjie). The process of coal burning is still unclear. However, it is certain that the degradation of carbon is occurred at that moment. At the same time the water gas shifts reaction. As a result, CO and H<sub>2</sub> are obtained. The gas enables the coal particle to burn. Meanwhile, oxygen diffuses into the coal and absorbed by inner particles of the material.

Another process used in coal chemistry is called liquefaction. In the course of this process liquid fuels such as petroleum are produced from coal. Pyrolysis is one of the methods of liquefaction. Liquefaction is the process where catalyst is used. In case of coal hydrogen is an agent used to speed up the reaction. This method is also called Bergius process because of the name of the discoverer. Dry coal is mixed with heavy oil recycled from the process. The catalyst is added and the reaction occurs at a certain temperature. Some manufacturers practice another method when coal is mixed with solvent and iron-based catalyst. Hydrogen is added only after the preliminary heating. All in all, liquefaction is rather controversial because of wastes which are produced together with the liquid coal products.

As it was written above, pyrolysis is a kind of liquefaction process. For example, pyrolysis is used to turn wood into charcoal. The wood is heated until the full carbonization is completed. After the process charcoal and ash are left. Actually, pyrolysis takes place in all the ways of coal procession. The process itself is divided into devolatilization, cracking and deposition (Chen, Wen). During the coal pyrolysis coal tar, oil and water vapor are produced. Oil and tar are later treated with hydrogen to remove traces of sulfur and nitrogen. After the purification these substances are used as fuels.

The last process used in coal chemistry is coal gasification. It is the process of producing coal gas, which is actually a mixture of carbon monoxide, hydrogen and carbon dioxide. The substance consists also of water vapor. Earlier, it coal gas was the main source of energy for lighting and heat in big

cities. Nowadays, the process of gasification is used for synthetic natural gas production.

## References

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Chen, L. H. & Wen, C. Y. A Model for Coal Pyrolysis. West Virginia University. Retrieved from [http://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/24\\_3\\_WASHINGTON\\_09-79\\_0141.pdf](http://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/24_3_WASHINGTON_09-79_0141.pdf)

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