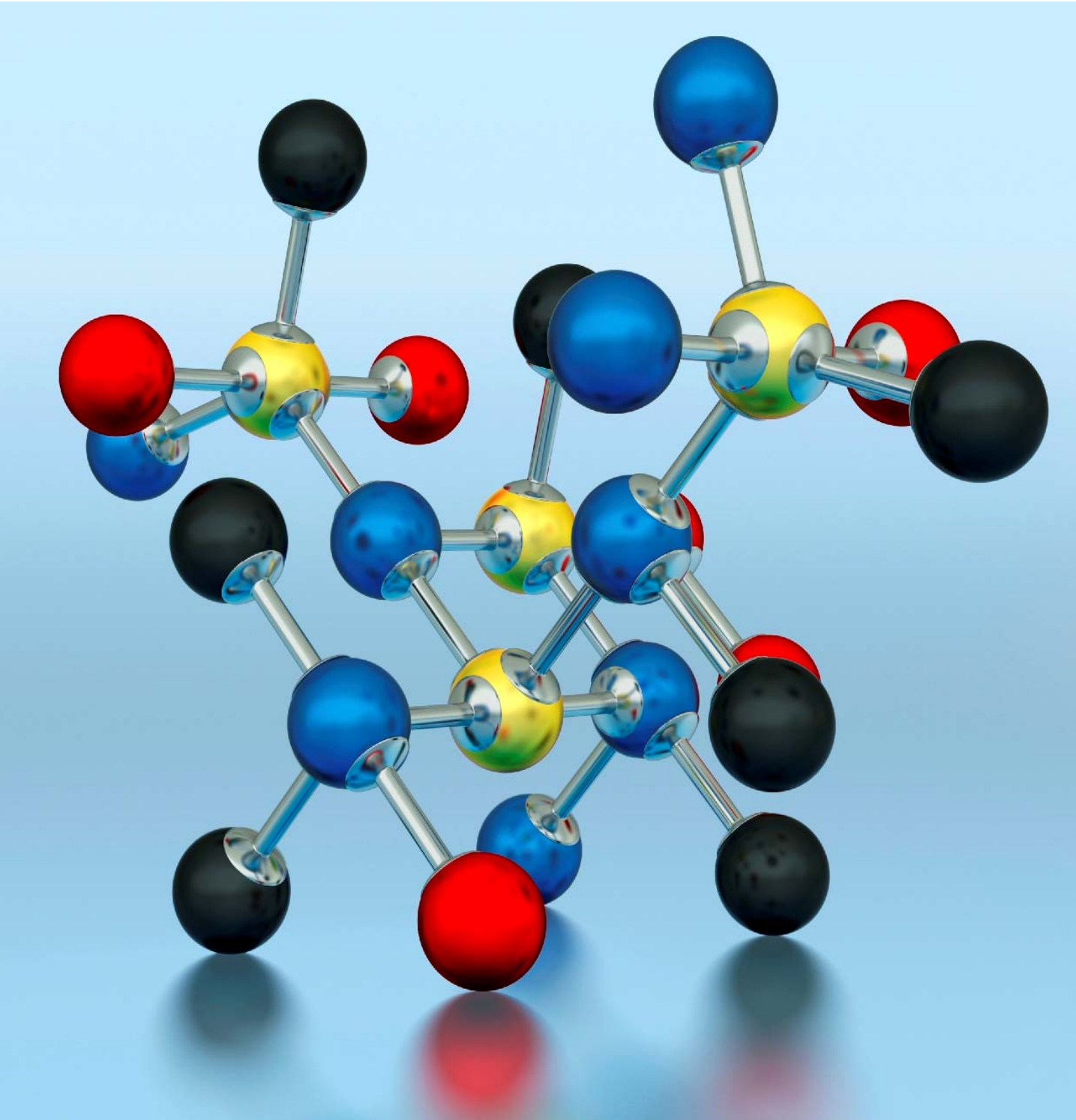
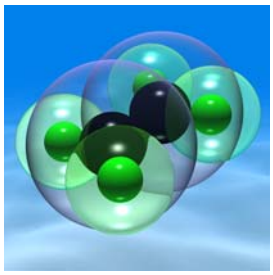
What is Pyrolysis?



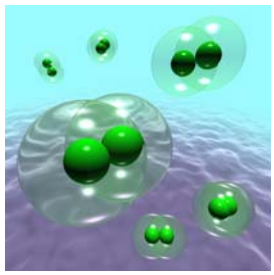
What is Pyrolysis?

Pyrolysis is the chemical and physical decomposition of organic material that occurs at high temperatures in the absence of oxygen. The conditions created during pyrolysis cause complex organic molecules to break down into simpler molecules and thus fundamentally and irreversibly alter their properties at a molecular level.

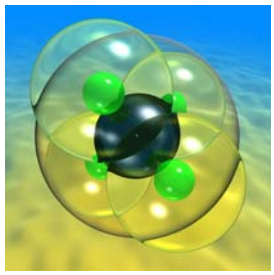
The outputs of pyrolysis are a carbon char (which can be almost pure carbon), a highly combustible hydrocarbon gas, consisting mainly of Carbon Monoxide, Hydrogen, Methane and Alkenes; and Distillate Oil.



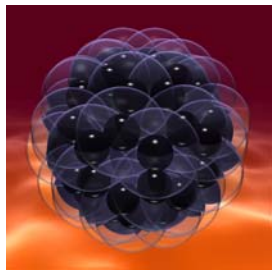
Ethylene Molecules



Hydrogen Molecules



Methane Molecule



Buckminster Fullerene

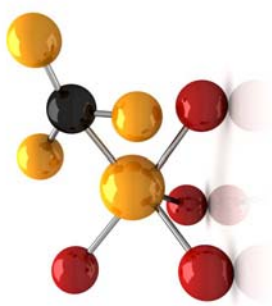
This process of decomposition caused by high temperatures and an absence of oxygen, shares many similarities with the natural decomposition processes that occur as part of the natural cycle of Planet Earth. The principle exception being that the natural process takes place over a period of 100 million years for bituminous coal, 300 million years for anthracite, and somewhere between the two for gas and oil.

Again, as in the natural world, where the composition of the oils, the gas and the quality of the coal can vary considerably from one field to another, the quality and composition of each of the outputs of Pyrolysis is very much dependent upon the type of material to be processed, the amount of moisture present and the size and density of that material.

Similarly, changing the conditions of a pyrolysis process will also yield vastly differing results. Altering the temperature, pressure and speed at which a reaction takes place, will result in different quantities of each residual and potentially shift the energy balance between each of them. As an example, Fast Pyrolysis (sometimes referred to as Flash Pyrolysis) requires the feed material to be reduced almost to a fine powder, with a moisture content of around 5% before processing. The process temperature is often extremely high and the residence time mere milliseconds. The yields however, are likely to produce very high proportions of Bio-Oils, as much as 75% of the weight of the original material. The point we make is simply that there are many ways of applying the process of Pyrolysis, some being better suited to a particular feedstock than others

Broadly speaking, the gas and char produced by Pyrolysis have high calorific values, and in most cases are purer than their natural counterparts, as many naturally occurring contaminants can be destroyed by higher levels of heat or refining and conditioning processes employed as part of the overall process.

Given the similarities between pyrolysis char, oil and gas and naturally occurring coal, oil and gas in terms of both their composition and in terms of how they are formed, it is hardly surprising that the outputs of pyrolysis can be compared with the naturally occurring resources of coal, oil and gas and thus provide excellent substitutes for our rapidly diminishing natural fossil fuels.



The Science : Burning, combustion and incineration are **Exothermic** processes. They release heat and light as a result of the oxidation of material - i.e. The reaction of matter with oxygen.

Although Pyrolysis is a thermal process, it is an **Endothermic** process – i.e. It needs heat to cause the decomposition to occur. Remove the heat and the process will immediately cease. Because pyrolysis does not burn, there are no emissions from the process. In addition, many naturally occurring toxic substances e.g. Volatile Organic Compounds, PAH's and PCB's, are broken down by the heat into inert chemical components.

EPi's technology is unequalled in terms of flexibility. No other process is capable of changing its conditions so completely, in order to meet the requirements of a variety of feedstocks, and thus ultimately control the characteristics of the final outputs.

Environmental Power International Ltd
Email : info@**EPi**Energy.com
UK Office – Tel 00 44 (0)1225 765816
www.**EPi**Energy.com