Kerogen- Composition and types

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Contents

Introduction

- Kerogen is the portion of naturally occurring organic matter that is nonextractable using organic solvents. It occur in source rock and may expel hydrocarbons upon thermal cracking. Typical organic constituents of kerogen are algae and woody plant material.
- It can be called as precursor of oil or natural gas.

Kerogen vs bitumen

Kerogen is any organic matter present in a sedimentary rock. It is insoluble in organic solvents. It consists lighter as well as heavier hydrocarbons and acts like a precursor of oil and natural gas. Whereas,

Bitumen is mineral pitch; a black, tarry substance, burning with a bright flame. It consists heavier hydrocarbons. It occurs as an abundant natural product in many places, as on the shores of the dead and caspian seas. It is used in cements, in the construction of pavements etc.

Types of Kerogen

Based on the chemical properties and the nature of the original organic matter three types of kerogen are generally recognized.

- Kerogen
  - Type I
  - Type II and
  - Type III

These three kerogen types generate different hydrocarbons hence their distinction and recognition are important.

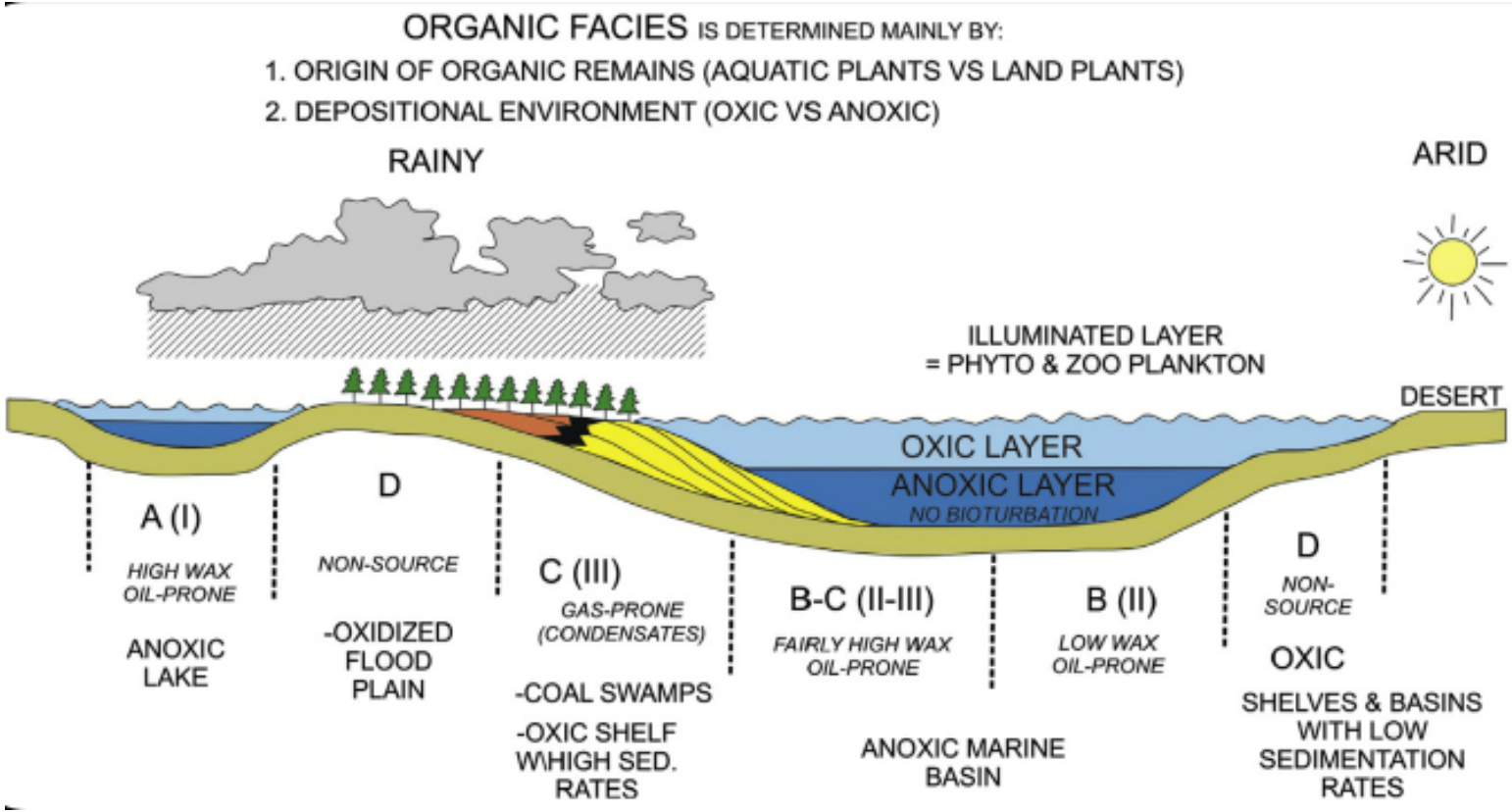


Figure: Organic facies and kerogen types (Selley and Sonnenberg, 2014).

Type I Kerogen

Type I kerogen is essentially algal in origin.

It has a higher proportion of hydrogen relative to oxygen than the other types of kerogen have (H:O ratio is about 1.2 to 1.7). The H:C ratio is about 1.65.

Lipids are the dominant compounds in this kerogen, with derivates of oils, fats, and waxes.

This kerogen is particularly abundant in algae such as Bottryococcus, which occurs in modern Coorongite and ancient oil shales.

Similar algal kerogen is characteristic of many oil shales, source rocks, and the cannel or boghead coals.

Type II Kerogen

Type II, or liptinitic, kerogen is of intermediate composition.

Like algal kerogen, it is rich in aliphatic compounds, and it has an H:C ratio of >1.

The original organic matter of type II kerogen consisted of algal detritus, and also contained material derived from zooplankton and phytoplankton.

The Kimmeridge clay of the North Sea and the Tannezuft shale (Silurian) of Algeria are of this type.

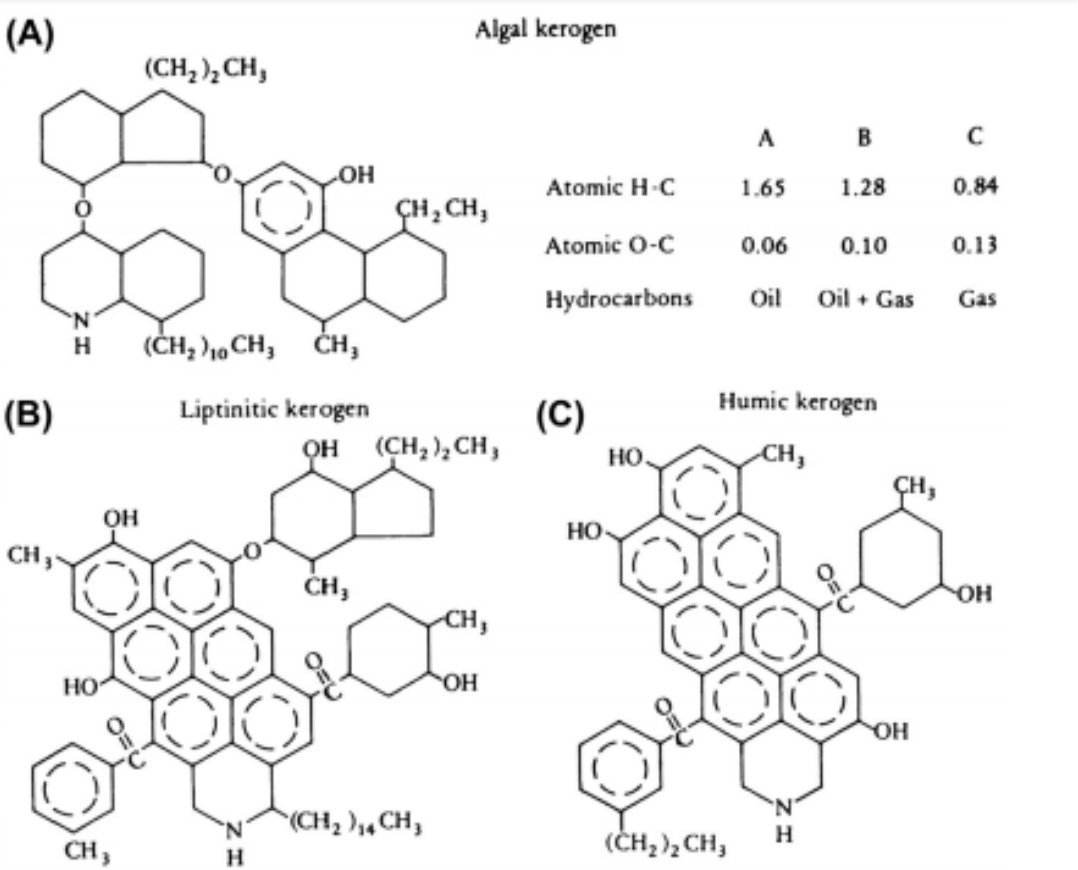
Type III Kerogen

Type III, or humic, kerogen has a much lower H:C ratio (<0.84). Chemically, it is low in aliphatic compounds, but rich in aromatic ones.

Humic kerogen is produced from the lignin of the higher woody plants, which grow on land. It is this humic material that, if buried as peat, undergoes diagenesis to coal.

Type III kerogen tends to generate largely gas and little, if any, oil.

The Green River formation of Colorado, Utah, and Wyoming is a noted example of type III kerogen.



	A	B	C
Atomic H-C	1.65	1.28	0.84
Atomic O-C	0.06	0.10	0.13
Hydrocarbons	Oil	Oil + Gas	Gas

Figure: The molecular structure of (A) type I, or algal, kerogen; (B) type II, or liptinitic, kerogen; and (C) type III, or humic, kerogen (Selley and Sonnenberg, 2014)

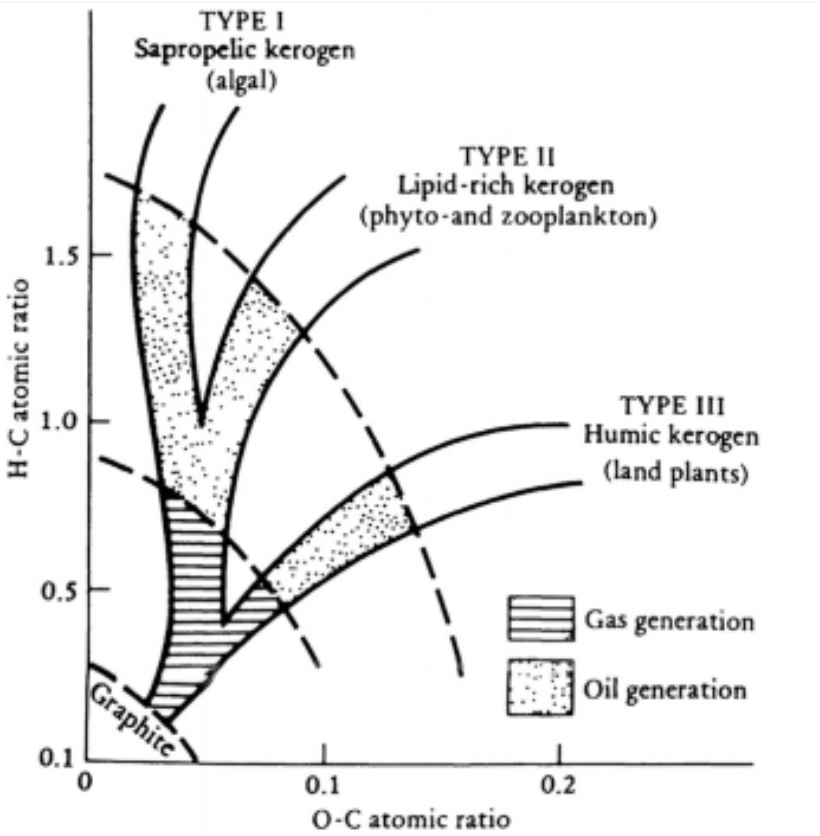


Figure: Graph showing the maturation paths of the three different types of kerogen (Selley and Sonnenberg, 2014).

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Thank you.

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