4.1 Definition and Importance of Kerogen

The term *kerogen* will be used here to designate the organic constituent of the sedimentary rocks that is neither soluble in aqueous alkaline solvents nor in the common organic solvents. This is the most frequent acceptance of the term kerogen, and results from a direct generalization to other rock types of the definition by Breger (1961) in carbonaceous shales and oil shales. However, it should be kept in mind that some authors still restrict the name kerogen to the insoluble organic matter of oil shales only, because kerogen originally was applied to the organic material found in Scottish shales, which yielded oil upon a destructive distillation. Such a distinction seems very artificial from a geochemical point of view, as the definition of “oil shale” is itself mostly an economic concept (a rock able to provide commercial oil products by heating) and subject to variations, according to the progress of technology and the fluctuation of petroleum economy.

A few authors seem to use the term kerogen for the total organic matter of sedimentary rocks. It is here understood that the fraction extractable with organic solvents is called *bitumen* and that the term “kerogen” does not include soluble bitumen (Fig. II.4.1).

As pointed out before, the early form (precursor) of kerogen in young sediments is the insoluble material that is also called “humin” by soil scientists, although its composition is different from compounds present in continental soils. The main difference between humin of young sediments and kerogen of ancient sediments is the existence of an important hydrolyzable fraction in humin; this fraction progressively disappears at depth. In geologic situations, there is usually an information gap, with respect to kerogen evolution, at relatively shallow depths of burial. Observations on core samples taken by oceanologists often cover the depths from 0 to 10 m (0 to 30 ft). By contrast, core samples taken by the oil industry usually start at 500 or 1000 m depth. Some wells drilled on behalf of the JOIDES program may help to fill the gap, although many sections cored in deep oceanic basins show little or no organic content. The observations reported in Chapter II.4 refer to the compositions and properties of kerogen to the extent that they can be analyzed below the previously mentioned depth gap. Furthermore, most of the considerations are related to the amorphous fraction of kerogen, that usually represents the bulk of the kerogen.
Kerogen is the most important form of organic carbon on earth. It is 1000 times more abundant than coal plus petroleum in reservoirs and is 50 times more abundant than bitumen and other dispersed petroleum in nonreservoir rocks (Hunt, 1972). In ancient nonreservoir rocks, e.g., shales or fine-grained limestones, kerogen represents usually from 80 to 99% of the organic matter, the rest being bitumen.

4.2 Isolation of Kerogen

The first and probably main hindrance when studying kerogen is to isolate kerogen quantitatively without notable alteration of the general structure. This preliminary isolation from the inorganic material is required for most physical or chemical analyses, which are constrained when minerals — generally far more abundant — are present.

Physical methods of separation based on difference of specific gravity (sink–float method) or differential wetting of the kerogen and minerals by two immiscible liquids, such as oil and water (Quass method), have been reviewed by Robinson (1969). The advantage of these methods is the absence of chemical alteration of kerogen, but recovery is normally incomplete and thus a fractionation of kerogen may occur.