

Asphaltite Deposits of Southeastern Oklahoma

Three Oklahoma oils and six associated asphaltites were studied and found to have a common source, based on geologic and geochemical criteria. Bulk analyses reveal the following: (1) vanadium and nickel are enriched in the asphaltite relative to the oil by an average factor of 41, although the V/Ni ratio only ranges from 0.5 to 3.5 in most of these samples; (2) the average H/C atomic ratio decreases and the average O/C, N/C, and S/C atomic ratios increase significantly from oil to asphaltite; and (3) stable carbon isotope ratio values show that the ratio of ^{13}C to ^{12}C in the asphaltites is essentially the same as that in the oils, being approximately -29.8 ppt (relative to PDB) in almost all cases. These bulk analyses and analysis of isolated chemical fractions of these materials indicate that the asphaltites and oils are of common origin and have a similar temperature history. These data further indicate that asphaltite is a secondary product after oil and that biodegradation, accompanied by other near-surface effects, is the causal mechanism for asphaltite formation. This conclusion is supported by the geology of the region, inasmuch as local listric faults could have served as conduits of migration, bringing deeper oil into the zone of near-surface alteration.

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Mineralogy and Petrology of Texaco's Hobson Uranium Deposit, Karnes County, Texas

Texaco's Hobson uranium deposit is located in Karnes County, Texas, along the prominent south Texas uranium trend. The uranium mineralization occurs in the Deweesville Sandstone of the Whitsett Formation of the Eocene Jackson Group. The host rock is a friable, fine-grained, well-sorted, highly porous and permeable sand interpreted to be a beach deposit. The sand contains significant volcanic constituents and ranges in composition from arkosic to tuffaceous. Locally, the host sand contains hard, dense opal-cemented sandstone beds. Bentonitic shales underlie and overlie the minerlized sand unit.

Geometrically, the Hobson uranium-bearing zone resembles an elongated roll-front type deposit. Chemical uranium values compared with gamma ray equivalent uranium values indicate that the uranium has been dissolved from the updip side and precipitated on the downdip side of the roll-front.

Details of the uranium mineralization were studied using thin section microscopy, autoradiography, X-ray diffraction, scanning electron microscopy, and energy dispersive spectroscopy techniques. The uranium mineralization occurs in the pores of the sand, as sand-grain coatings and as replacements of sand-size and smaller grains. The uranium mineralization is commonly associated with pyrite and other opaque grains. Favored hosts for uranium, other than pore openings, appear to be clay aggregates, altered rock and glass fragments, and carbonaceous plant debris. Aggregates of coffinite were identified by XRD and SEM-EDS analyses. Some uranium mineralization also appears to be dispersed, and is postulated to be adsorbed on the clay and carbonaceous matter.

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Domestic Uranium Exploration—Another Perspective

Inherent in a decision to spend money in exploration is an

explicit or intuitive judgment that the orebodies found will be rich enough and the market strong enough to support profitable production reasonably soon after discovery. For uranium, these judgments are based upon general principles that derive from historical behavior patterns in other cyclically priced resource commodities, and upon extrapolation of recognized trends that pertain to uranium's unique characteristics. Some of these factors are discussed in an examination of strategies which could be pursued in uranium exploration and development for the 1980s.

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Toward a General Theory of Vertical Migration

Between 1951 and 1954, the Southwest Research Institute of San Antonio evaluated over a hundred little known exploration methods and found only geochemical, radiometric, and electrical methods to be worthy of careful scientific study. Critical examination of the now extensive literature of all three generic methods seems to indicate a mechanism which may relate each method to the other: the physical-chemical phenomenon of vertical migration. A selective review of the theoretical and empirical literature of these methods, together with a similar review of applicable geologic and hydrogeologic studies, was undertaken. Indications that vertical migration is not an implausible common mechanism reinforces the potential validity of each of the methods and suggests the need for additional research directed toward a conclusive condemnation or validation of these methods.

Considering the total of pre-drilling exploration efforts, the current limited use of surface geochemical, radiometric, and electrical methods seems only to preserve them in limbo. Ambiguities will undoubtedly continue to exist, as in all other exploration methods, even if subsequent research should demonstrate increased operational validity of the three methods. The opportunity-cost of not properly using these methods would be tremendous should they be determined to be more reliable than is generally conceded. This consideration, together with the indications of plausibility which this paper describes, justifies serious and concentrated research and demonstration efforts of an order not hitherto performed.

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Mesozoic and Tertiary Carbonate Buildups and Factors Which Control Their Distribution

With the development of global paleogeographic reconstructions, it is possible to examine the original distribution of carbonate buildups at various times in the earth's history. Through an extensive search using published geologic literature, carbonate buildups have been classified based on their association with shelf-edge, shallow-shelf, and basinal sediments. By plotting the data on well-constrained Mesozoic and Tertiary paleogeographic continental reconstructions, it is observed that carbonate buildups are generally restricted to low latitudes. However, the maximum excursion of buildups from the paleoequator varies significantly through geologic time.

The distribution and abundance of carbonate buildups in the Mesozoic and Tertiary appear to be partly controlled by ancient ocean current systems. In a manner similar to the present, carbonate buildups extend further toward the poles along east-facing coastlines. Here, warm westward-flowing