

Nickel and Vanadium

Using trace metals for anomaly identification and characterization.

Trace metals have long been used to help identify areas of alteration due to hydrocarbon microseepage. The methods of analysis are simple and very accurate. Twenty eight metals have been identified as indirect indicators of which Nickel and Vanadium are the most widely used as indicated in the literature.

All native petroleum contain some inorganic constituents. Trace metals occur in petroleum in one of two forms. Either as an organometallic porphyrin related to the original organic material or as a non-porphyrin metal found in the resin or asphaltic fraction of the oil. Possible sources of trace metals in oils are

- ◆ through incorporation and diagenesis of metal complexes of the original biological material
- ◆ through incorporation into the organic matrix during diagenesis of the biological material in the source rocks either from clay minerals or interstitial aqueous solution
- ◆ through uptake from an aqueous phase or mineral phases during primary or secondary migration
- ◆ from formation waters or from reservoir rock minerals (Yen, 1975).

When referring to surface geochemical exploration, trace metals are primarily used to identify anomalous areas of hydrocarbon microseepage. Nickel and

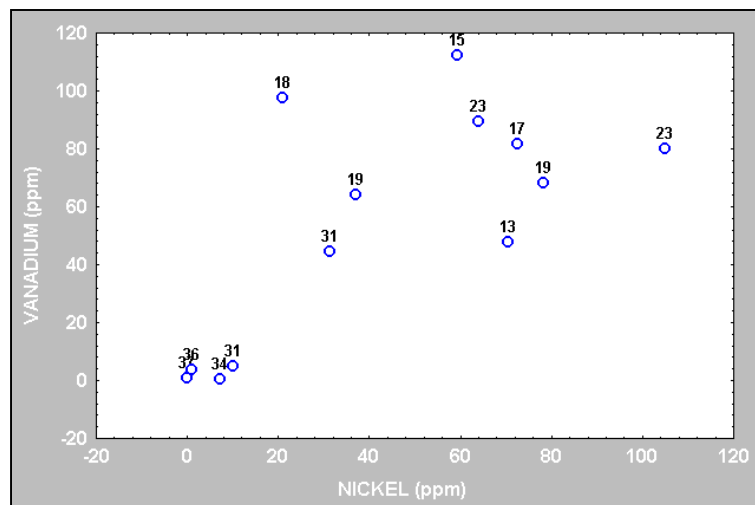


Fig. 1 Inverse relationship of metal content and API gravity. Gravity is shown above symbols. (Clayton and Koncz, 1994).

Vanadium occur as near surface "halos" which define the periphery of the accumulation at depth. This is due to local changes in pH and Eh indirectly related to vertically seeping hydrocarbons.

Much of the literature states, that as the amount of metal in crude oil increases the gravity of the oil decreases (Fig. 1)

there by making Nickel and Vanadium of value in characterizing some reservoir attributes. The literature also proposes the use of V / Ni ratios for a determination. Figures 2 and 3 show two separate sets of data that would suggest that this is possible. In both sets of data the Cretaceous age reservoirs are characterized by higher Nickel concentrations relative to the Vanadium concentrations. In Fig. 2 the Pennsylvanian crude oils exhibit substantially higher Vanadium concentrations relative to Nickel.

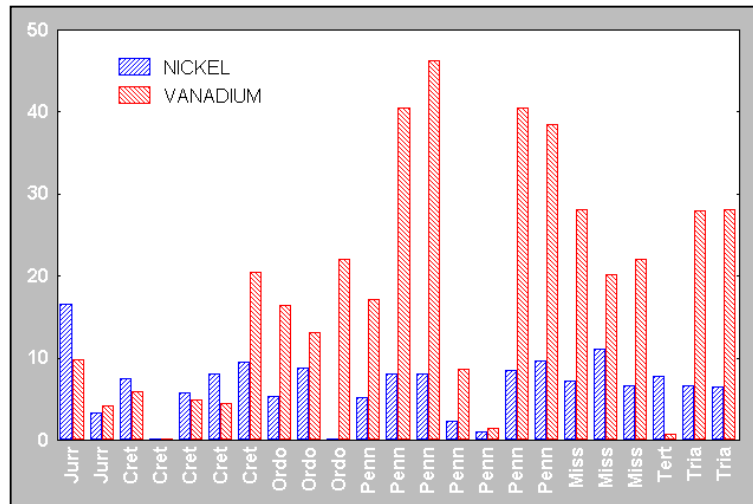


Fig. 2 Amount of Nickel and Vanadium in oils from various geologic horizons. Note that the Nickel is higher than Vanadium in the Jurassic and Cretaceous oils (Yen, 1975).

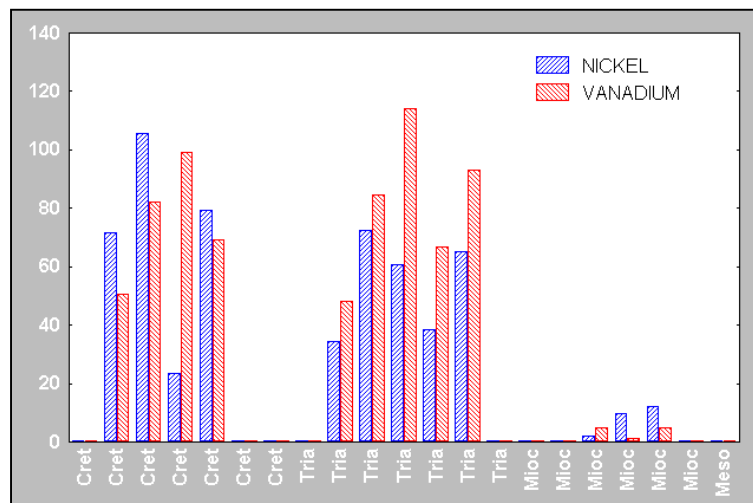


Fig. 3 Additional Nickel and Vanadium data from oils of various geologic horizons. Note the similar Nickel – Vanadium relationship in the Cretaceous age oils as found in Figure 2. (Clayton and Koncz, 1994)

Turkey Creel Oil Seep

The Turkey Creek Oil Seep is located approximately 12 miles west of Denver, Colorado.

