

Enigma of Coal as Source Rock

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I. INTRODUCTION

The concept of terrestrial organic matters as source rock of petroleum generation was evolved after the publication of Hedberg(1968) who described high wax oils are generated from terrestrial organic matters. Coals are known to have generated from terrestrial organic matters and it has been accepted as a source of petroleum generation but it creates a major misunderstanding about petroleum generation. Petroleum source rock is essential to deposit in anoxic environment but coals are deposited in oxic environment. In this work attempt has been made to analyse the justifications in favor and against the proposal.

Evidences in favour of coal as source of petroleum:

1. The H/C in coal is comparable to those of kerogen(Hunt,1995):

Kerogen	Ratio	Coal	Ratio
Type-I	1.45	Boghead	1.5
Type-II	1.25	Cannel	1.2
Type-III	0.8	Humic	0.8

From the above table it is observed that Boghead coal should generate as much oil as Green River oil shale but till today no oil field is discovered related to Boghead coal. Humic coals are considered as source of gas generation.

1-Meissner(1984) estimated that the Fruitland Coal of Sanjuan basin generated 55TCF of methane of which 26 TCF are adsorbed. It is very clear that hydrocarbon generation calculation does not prove its source characterization.

2-Hunt(1995) suggested Cooper Basin gas fields of Australia sourced from Permian coals and deep western Canada basin gas fields sourced from Lr.Cretaceous – Jurassic coals. Both of these Australian and Canada basins have oil and gas fields but author have not justified why source of oil and gas will be different. It is more possible that both oil and gas generated from the same non-identified source.

3-Lewan(1990) experimentally proved hydrous pyrolysis of humic coal from King coal mine of Utah produce 5.5 to 16 wt% of waxy oil. It is a definite proof of coal generating oil but state of generation

must follow hydrous pyrolysis system which is not naturally available in coal mines.

4-some petroliferous basins do not have any other possible marine source present except coal bearing horizons but it cannot conclude coals have sourced petroleum because migration of petroleum from other source cannot be ignored.

5-Hedberg(1968) also commented high wax cannot be generated from marine source but it is not true because petroleum wax is paraffin wax which is made of kerogen.

Evidences against coal as source of petroleum

1. The same type of coal with similar maturity in other basin is not associated with petroleum generation. Proponents however put argument against this objection saying that the coals are not same type, particularly oil field coals are perhydrous vitrinite or liptinite rich but observation of field data indicate that oil field coals are at best 10%-12% liptinite rich which is not very uncommon in Pennsylvanian coals of Europe & USA but no oil field is associated. Also perhydrous vitrinite is not a primary maceral of coalification process (swapan,2012).
2. The types of kerogen correlation with coals as shown in table-1 is correlatable but types of kerogen need immediate modification because now kerogen is considered for hydrocarbon compounds of insoluble organic solvents. It is hereby proposed to define kerogen as hydrocarbon compounds of insoluble organic solvents that are also generative of petroleum. However the parameters of petroleum generation are not very effective for which classification of kerogen is not effective.
3. The other problem of coal as petroleum source is that coals in general are high adsorbents for which primary migration is difficult. Source rock is defined as a rock which can generate and extinguish commercial hydrocarbons. So if it is prohibited generation or primary migration then it cannot be considered as any source.

II. CONCLUSIONS

The possibility of source potential of coal is oriented on two problems – (1) whether coal has any potential of oil generation or not and (2) whether primary migration from coal is feasible or not. In this regard I accept petroleum is generated from organic matters but all organic matters are not susceptible for petroleum generation because average petroleum has H/C =1.83 for which carbohydrates in organic matter has H/C=1.63 proteins has 1.58 Lipids has 1.89 and Lignins has 0.95 suggesting organic matters rich in lipid fraction can only be capable of petroleum generation. Further also it is known that terrestrial lipids have lower H/C compared to marine algal lipids. It is therefore decided marine lipid rich organic matters are suitable source rocks. Thus coals cannot be able to generate petroleum. Also coals are deposited in oxic environment which will not be suitable for petroleum generation. Also it is to be noted that gas generation require more hydrogen per carbon than oil suggesting also gas generation from coal is not possible. Because of high adsorption capacity of coal primary migration is also difficult suggesting coals can neither generate nor migrate hydrocarbons confirming coal is not expected source rock and also not any type of kerogen. Therefore it is concluded coals are not to be considered any source of petroleum oil or gas. Together with this I would

like to suggest CBM gases are also not sourced from coal. This is because most of the CBM fields of the world are lying within petroliferous basins.

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