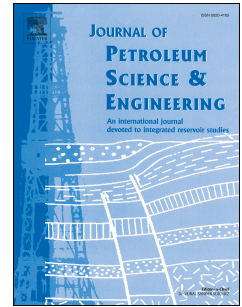


# Accepted Manuscript

A new technique for electrical rock typing and estimation of cementation factor in carbonate rocks

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PII: S0920-4105(18)30231-6

DOI: [10.1016/j.petrol.2018.03.045](https://doi.org/10.1016/j.petrol.2018.03.045)

Reference: PETROL 4786

To appear in: *Journal of Petroleum Science and Engineering*

Received Date: 20 January 2018

Revised Date: 5 March 2018

Accepted Date: 9 March 2018

Please cite this article as: Soleymanzadeh, A., Jamialahmadi, M., Helalizadeh, A., Soulgani, B.S., A new technique for electrical rock typing and estimation of cementation factor in carbonate rocks, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2018.03.045.

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# 1 A New Technique for Electrical Rock Typing and Estimation of Cementation Factor 2 in Carbonate Rocks

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## 6 Abstract

7 Natural heterogeneity of carbonate rocks causes difficulties in estimation of their petrophysical  
8 properties such as cementation factor. These problems are mainly caused by complex pore  
9 structure of carbonate rocks and presence of various types of pore in them. Generally, when  
10 analyzed versus porosity, formation resistivity factor ( $F$ ) data are highly scattered in carbonate  
11 reservoirs. Several methods have been reported in literature to decrease such data scattering such  
12 as data classification by permeability, pore types and reservoir rock types. However, outcomes  
13 of these techniques have exhibited still some degree of the data scattering. Besides, many  
14 correlations have been developed to relate cementation factor to porosity such as Borai's and  
15 Shell correlations. Indeed, these correlations take into account the porosity rather than further  
16 considering rock quality in terms of electrical conductivity.

17 In this paper, Electrical Quality Index (EQI) is proposed as a new parameter for classification of  
18  $F$  data in an attempt to improve estimation of cementation factor. Rock samples with similar  
19 EQIs have similar electrical behavior. In other words, EQI can be used to group rock samples  
20 into distinctive groups with specific equations of formation resistivity and cementation factors  
21 versus porosity. The proposed technique was applied to the 112 carbonate rock samples reported  
22 in Ragland's work. EQI divided these samples into 9 groups which have different equations of  $F$   
23 versus porosity with high values of determination coefficients. Also, cementation factor versus  
24 porosity plots showed linear trends with high determination coefficients for all of the EQI  
25 groups.

26 **Keywords:** Formation Resistivity Factor, Cementation Factor, Electrical Quality Index,  
27 Tortuosity

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