



Original article

The rudist buildup depositional model, reservoir architecture and development strategy of the cretaceous Sarvak formation of Southwest Iran



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ARTICLE INFO

Article history:

Received 28 January 2015

Received in revised form

1 April 2015

Accepted 3 April 2015

Keywords:

Iran
Southwest Iran
Sarvak
Lithology facies
Depositional model
Reservoir architecture
Development strategy

ABSTRACT

This paper studies the lithofacies, sedimentary facies, depositional models and reservoir architecture of the rudist-bearing Sar-3 zone of Cretaceous Sarvak in the Southwest of Iran by utilizing coring, thin section, XRD data of five coring wells and 3D seismic data. Research results include the following: According to lithofacies features and their association, the rudist-mound and tidal flat are the main microfacies in the Sar-3 depositional time. By investigating the regional tectonic setting and seismic interpretation, a depositional model was built for the Sar-3 zone, which highlights four key points: 1) The distribution of the rudist-buildup is controlled by the paleo-high. 2) The build-up outside of the wide colonize stage but reached the wave-base level in a short time by regression and formation uplift, and was destroyed by the high energy current, then forming the moudly allochthonous deposition after being dispersed and redeposited. 3) The tidal flat develops widely in the upper Sar-3, and the deposition thickness depends on the paleo-structure. The tidal channel develops in the valley and fringe of the Paleo-structure. 4) The exposure within the leaching effect by the meteoric water of the top of Sar-3 is the main controlling factor of the reservoir vertical architecture. The Sar-3 zone featured as the dualistic architecture consists of two regions: the lower is the rudist reef limestone reservoir and the upper is the tidal condense limestone interlayer. The thickness of each is controlled by the paleo-structure. The Paleo-high zone is the preferential development zone. Based on reservoir characteristics of the different zones, a targeted development strategy has been proposed. Keeping the trajectory in the middle of the oil-layer in the paleo-high, and in the paleo-low, make the trajectory crossing the oil-zone and then keep it in the lower.

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1. Introduction

Rudists are one vital reef builder of the Cretaceous, the formed reef and related reservoir play as an important role in the world [17,18,24]. Particularly in the Middle East, the rudist

bearing reservoir always contains huge reserves [18,28]. However, the formation with rudist fossil found in China [11,23] has so far been found without any related oil/gas reservoir. Accordingly, the knowledge about the depositional model, reservoir characteristics and exploration experience with rudist bearing

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Peer review under responsibility of Southwest Petroleum University.



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carbonate reservoirs has been extremely limited for Chinese scholars. Recently, with the increasing foreign cooperative projects related to rudist reservoirs by Chinese oil companies [8,16], it is very important and valuable to study it.

The Middle East scholars have built the rudist depositional model by considering different influencing factors including paleoclimate, sea-level fluctuation, tectonic activity, etc. [7,19,28,5,26,13, 20–22]. Although there have been achievements in various aspects, but all of them focused on the rudist reef itself which represents the good reservoir. In the oil fields

along the Iran–Iraq border zone, it was believed that the distribution of rudist buildup was controlled by the paleo-high [20–22,28]. The paleo-topography of the field area could cause different lithofacies, depositional characteristics and diagenetic environment as well as further impact on the reservoir architecture. This paper considers the rudist bearing zone of the Cretaceous Cenomanian Sarvak in the SA oil field in southwest of Iran as a research object, mainly to study the rudist buildup depositional model and the corresponding reservoir architecture, then propose a future development strategy for the oil field.

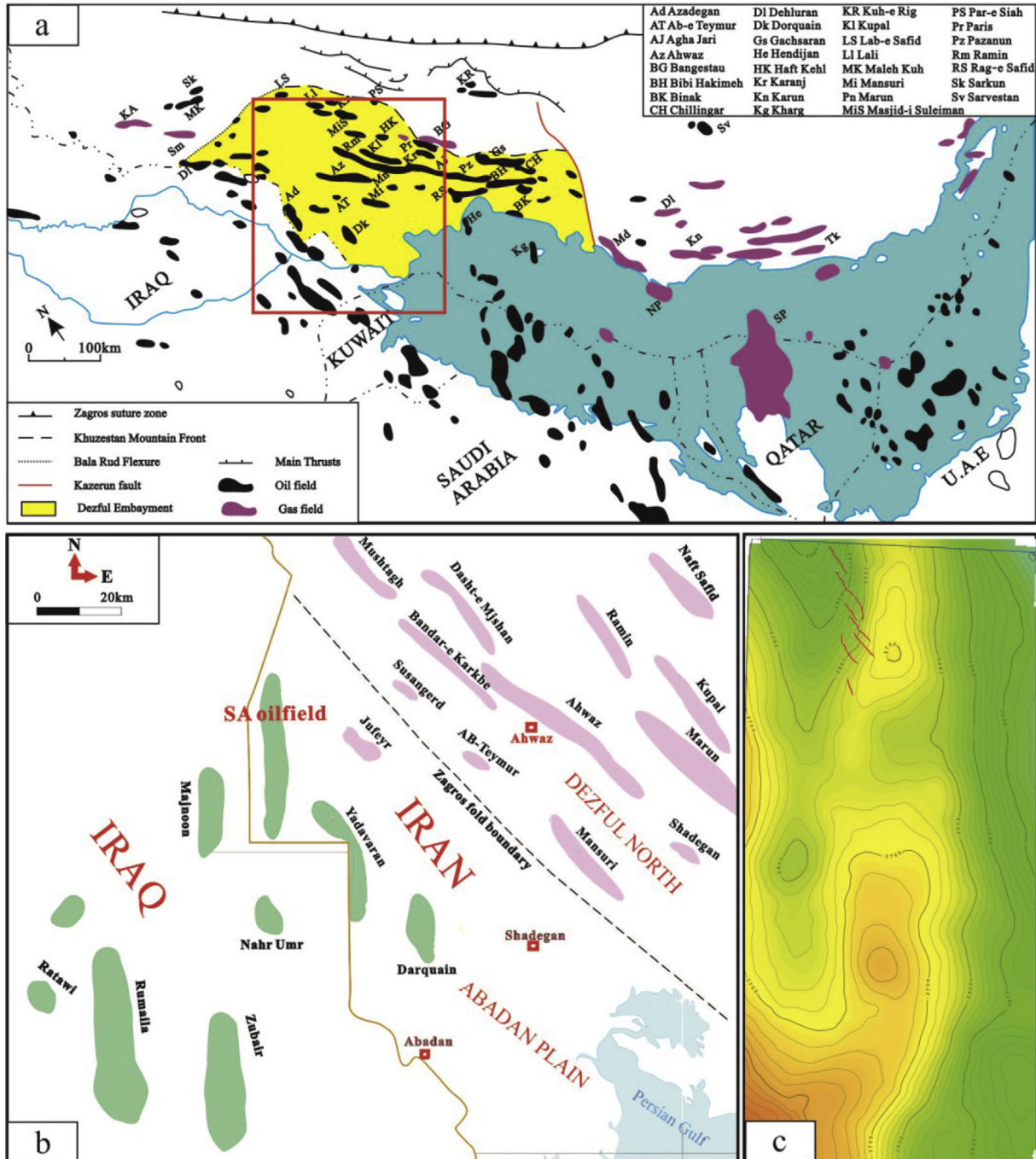


Fig. 1. Location map of oil and gas fields in the Zagros Foothills and Persian (Arabian) Gulf: (a) The geographic location map of the SA oil field in the Dzeiful embayment; (b) The structural map of the Sarvak Formation of the SA field; (c).

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