



中國石油大學

CHINA UNIVERSITY OF PETROLEUM

2015 碎屑岩成岩作用前沿研究国际研讨会

会 议 指 南

中国石油大学（华东） 地球科学与技术学院

二零一五年一月二十日

中国 青岛

一、会议通知

经商定，2015 碎屑岩成岩作用前沿研究国际研讨会拟定于 2015 年 1 月 26 日在山东青岛召开。现将有关事宜通知如下：

一、会议主办单位

中国石油大学（华东）

二、会议承办单位

中国石油大学（华东）地球科学与技术学院

三、组委会

主任：操应长 中国石油大学（华东）地球科学与技术学院

四、会议主题

幕式成岩事件、成岩物质来源、流体演化、泥页岩成岩作用等

五、会议宗旨

崇尚学术，学术交流，互相学习，共同进步。

六、会议时间：2015 年 1 月 26 日

七、会议地点：

中国石油大学（华东）青岛校区工科楼 C-757 学术报告厅

八、会议联系人

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二、会议日程安排

26 日上午

地点：工科楼 C-757

时间		题目	报告人	主持人
上午	8:30	操应长院长致词	操应长	操应长
	8:40-9:30	Event cementation in sandstone	Jon Gluyas	
	9:30-10:20	Element mobility during sandstone diagenesis: example from Jurassic deep water sandstones UK North Sea	Jon Gluyas	
	10:20-10:30	休 息		
	10:30-11:30	Oxygen isotopic constraints on quartz cementation in reservoir sandstones	Andrew Aplin	

26 日下午

地点：工科楼 C-757

时间		题目	报告人	主持人
下午	14:30-15:30	Pore water evolution and revolution during the diagenesis of Permian desert sandstones from the southern gas basin UK	Jon Gluyas	操应长
	15:30-15:40	休 息		
	15:40-16:30	Diagenesis, petrophysics and pore systems of shale gas reservoirs	Andrew Aplin	
	16:30-17:30	Seals and Leakage in Petroleum Systems	Andrew Aplin	

三、报告摘要

1、Event cementation in sandstone 主讲人: Jon Gluyas

摘 要: Research conducted within BP Exploration Company during the decade from 1985 revolutionised the way in which geoscientists understood the mechanisms of cementation in sandstones. The work was conceived in order to be able to forecast accurately the porosity and ultimately permeability, ahead of drilling petroleum exploration wells. Access to fresh, unweathered rock from oil and gas wells coupled with core analysis data and new techniques in isotope geochemistry, electron microscopy, fluid inclusion microscopy led to many quantitative studies. The impact of compaction, mineral dissolution and mineral precipitation followed a pattern which was often interpreted to indicate that diagenesis was a slow progressive process taking tens to hundreds of millions of years and typically leading to sandstones with ever poorer porosity and permeability. The research done within BP Exploration and other companies and universities working on the North Sea began to challenge the view that diagenesis was progressive and slow. Multiple data sets from many different sandstones showed a different picture. Potassium/argon dating of illite cementation in Permian sandstones suggested that precipitation almost certainly occurred in a period of less than ten million years. More persuasive were data from fluid inclusion analysis of Middle Jurassic sandstones from offshore mid-Norway. Precipitation temperatures of the quartz varied from cooler in the shallower samples to hotter in the deeper ones. However, when transposed using the thermal and burial history data for the area, to 'time of precipitation', it was clear that irrespective of depth, cementation occurred simultaneously across the whole basin in just a few million years at most. It became clear that cementation was episodic and geologically fast. The term 'event cementation' was coined. Observations on progressive porosity loss with depth were explained in terms of the non-linear solubility of minerals (quartz in particular) as a function of temperature such that in a single event deeper, hotter sandstones will become more cemented than shallower cooler ones.

2、Element mobility during sandstone diagenesis: example from jurassic deep water sandstones UK North Sea 主讲人: Jon Gluyas

摘 要: The Upper Jurassic Brae Formation sandstones of the South Viking Graben North Sea were deposited as deep water fans. The enclosing and interbedded mudstones belong to

the Kimmeridge Clay Formation. In the area of this study source rock is mature for oil and currently expelling petroleum. The Brae Formation sandstones are orthoquartzites with less than 5% of feldspar and rock fragments. Diagenesis is very simple. Carbonate concretions formed during early diagenesis, close to the sediment water interface. Carbon isotope data indicate that the concretions were the product of bacterial sulphate reduction of organic matter. The precipitation of the concretions occurred before significant compaction and before all other diagenetic processes. Petrographic examination of grains of sand within the concretions reveals that quartz grains are free of quartz overgrowths and few feldspar grains have no dissolution pits. Outside of the concretions feldspars are highly corroded and all quartz grains have quartz overgrowths. Fluid inclusion thermometry and thermal history indicate that much of the quartz precipitated in the early Tertiary at a time when rapid burial of the sandstone slowed and when oil first began to be generated in the Kimmeridge Clay and expelled into the Brae Formation. The fluid inclusion in the quartz cements also demonstrate that cementation and oil emplacement were occurring simultaneously. Whole rock geochemistry was used to compare the original sand as deposited and trapped within the concretions and that outside the concretions which had undergone quartz cementation. From the results it was clear that the sandstone must have imported SiO_2 during diagenesis. Comparable work on the interbedded Kimmeridge Clay shales suggested that the added silica could come from within the shales although as yet the transportation mechanism remains unclear.

3、Oxygen isotopic constraints on quartz cementation in reservoir sandstones

主讲人：Andrew Aplin

摘 要：The oxygen isotopic composition of diagenetic quartz, along with fluid inclusion data, places important constraints on cementation temperatures and also the fluids from which quartz precipitated. Local sources of silica are required, from pressure solution in sands or possibly from adjacent shales. Recent technological advances involving Secondary Ion Mass Spectrometry (SIMS) mean that it is now possible to make in situ analyses of 2um areas of quartz, so that isotopic profiles are possible across individual quartz overgrowths. SIMS oxygen isotopic data from North Sea and Gulf of Mexico sandstones are consistent with a model of continuous quartz cementation from around 60-130°C, in waters which evolve isotopically as a result of water-rock reactions. The data suggest that the abundance of quartz

cement in sandstones can be estimated if the time-temperature history is known.

4、Pore water evolution and revolution during the diagenesis of Permian desert sandstones from the southern gas basin UK 主讲人: Jon Gluyas

摘 要: The Permian Rotliegend sandstones of western Europe are the most important gas reservoirs in Europe, with gas sourced from the underlying Carboniferous Coal Measures. Reservoir quality in the Rotliegend is highly variable, even in similar desert aeolian and fluvial sandstones. For example in the Cleeton Field porosity can be 25% and permeability measured in darcies while in the adjacent Ravenspurn Field the same sandstones can be tight. Tight sandstones from the Rotliegend typically have abundant illite cement with minor kaolinite, chlorite, quartz and dolomite. Analysis of the isotope geochemistry of the diagenetic phases revealed a complex history of pore water evolution and subsequent revolution from evaporated hyper saline marine (Permian) to evolved Upper Jurassic rain water to local mixing of evolved water from the Permian with substantially different water from the underlying Carboniferous. Formation water of all origins has at different times been displaced from closed structures by migrating hydrocarbon gases further complicating the diagenetic history of the sandstones. The significant and wholesale changes in porewater can be linked to major tectonic episodes in the basin; rifting at end Jurassic and inversion during the Tertiary.

5、Diagenesis, petrophysics and pore systems of shale gas reservoirs 主讲人: Andrew Aplin

摘 要: We have used mercury injection, low pressure gas sorption and electron microscope techniques to quantify the way in which pore systems in organic-rich shales evolve as a function of maturity and mineralogy. Each technique generates different results for the pore systems so that all three are required to quantify both the distribution of pore throats and pore bodies, along with their connectivity. Mineralogy (carbonate, clay, organic matter) plays a critical role in controlling the pore system, as does the generation of oil and gas from kerogen.

6、Seals and Leakage in Petroleum Systems 主讲人: Andrew Aplin

摘 要: All seals overlying petroleum reservoirs leak; the important question is then the rate of leakage. In this talk we look at the evidence for leakage and then the main geological and geochemical controls on leakage paths and mechanisms. This involves an understanding of the sedimentology and diagenetic history of the (mudstone) seals, and how the petrophysical and geomechanical properties of the rocks evolve during burial.