

湘鄂西地区油气藏类型及勘探方向

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摘要: 湘鄂西地区花果坪复向斜中北部、桑植-石门复向斜中部的构造改造程度弱, 处于古构造的斜坡上, 是寻找原生油气藏的有利地区。花果坪复向斜南部以及桑植-石门复向斜西部处于古构造斜坡下部, 构造改造程度较弱, 有望发现继承性油气藏。宜都-鹤峰复向斜中部及中央复向斜上部成油组合, 因受构造运动强烈改造, 志留系盖层被剥蚀, 仅存下部含油组合, 只能寻找重建型油气藏。

关键词: 油气藏; 类型; 构造活动; 勘探方向; 湘鄂西地区

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1 地质概况

湘鄂西地区大地构造背景处于扬子板块中部, 其边界为: 东起湖北宜昌-湖南临澧一线, 南到湖南慈

利-保靖-酉阳-彭水一线, 西达彭水-利川团堡一线, 北抵鄂境兴山, 位于东经 $108^{\circ} \sim 111^{\circ}50'$, 北纬 $28^{\circ}50' \sim 31^{\circ}20'$ 之间, 总面积 $58\,825\text{ km}^2$ 。包含中央复背斜、花果坪复向斜、宜都-鹤峰复背斜、桑植-石门复向斜和秭归复向斜 5 个次级构造单元(图 1)。

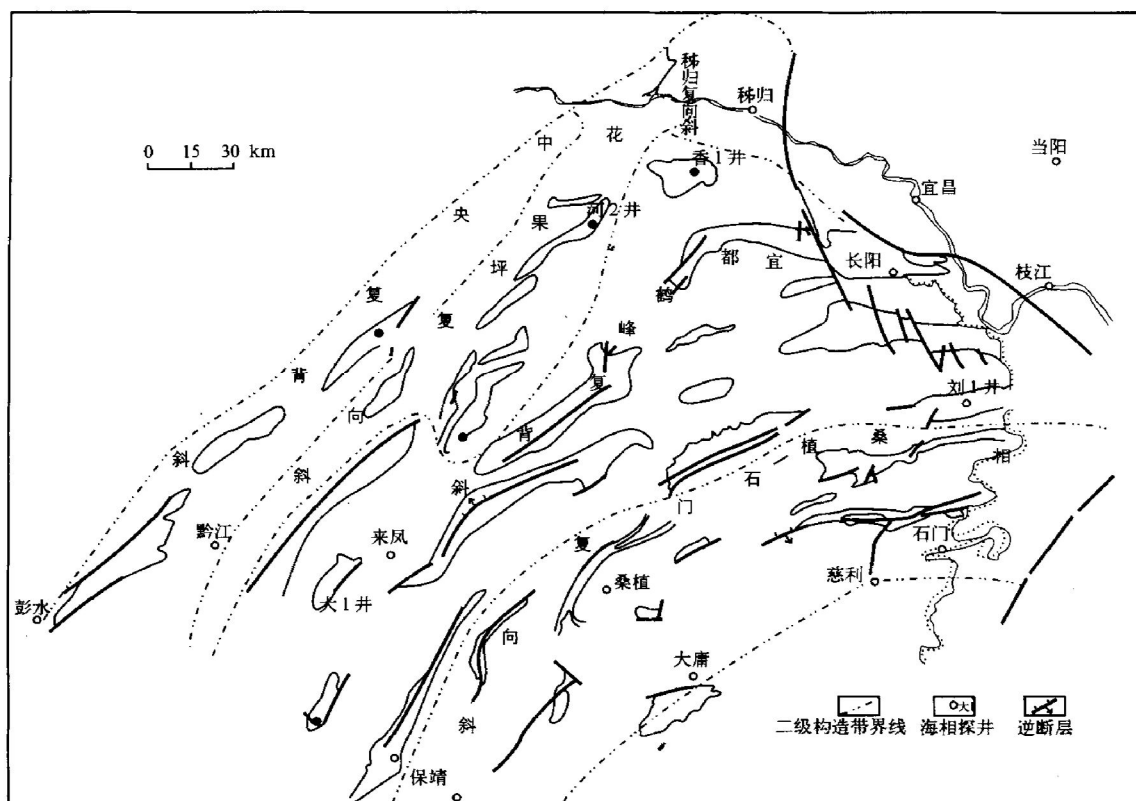


图 1 湘鄂西地区二级构造单元划分图

Fig. 1 Division sketch map of secondary structural units in the western region of Hunan and Hubei

湘鄂西地区是我国南方下古生界海相地层油气勘探的战略准备区之一。20 世纪 60 年代以来,

完成了大量的地面地质调查, 钻井 28 口, 并在宜 3 井、咸 2 井、河 2 井见可燃气显示。

2 油气藏类型

根据本区油气成藏的基本石油地质条件和烃源层有机质热演化、储层孔隙演化、盖层演变、构造演化史与古构造位置的配置以及河 2 井、宜 3 井和咸 2 井可燃气体的存在, 预测本区存在 3 种类型的油气藏, 即原生型油气藏、继承型油气藏、重建型油气藏。

2.1 原生型油气藏

原生油气藏形成的基本条件是: 主要的区域盖层形成于油气生成之前; 主要储集层在油气的生成高峰期业已具备较为充分的储集空间; 区域构造环境对油气藏发育有控制与改造作用, 自油气生成开始, 直至现今始终保持相对稳定的状态, 由古隆起向今局部构造连续渐进式发育。河 2 井钻于花果坪复向斜中北部河捞子构造, 该区志留系、下寒武统有效盖层形成期早于烃源岩生油、气高峰期(图 2),

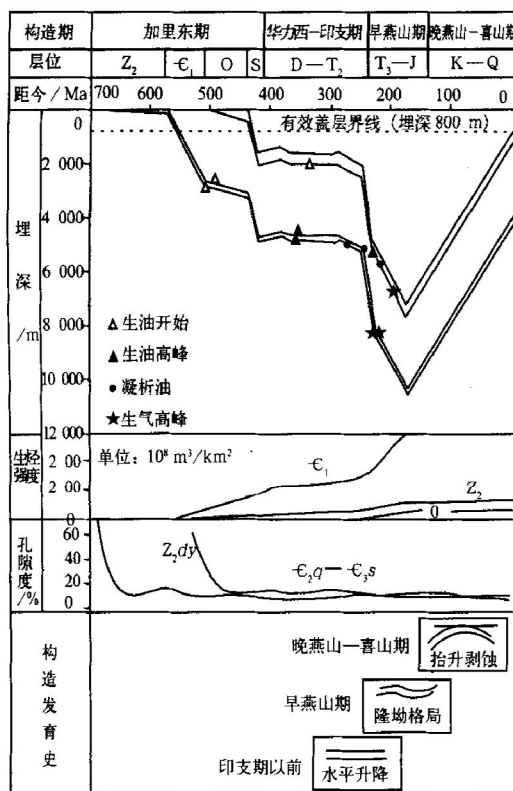


图 2 河 2 井原生型油气藏成藏系统图

Fig. 2 Pool-forming system showing a prototype oil and gas reservoir in He No. 2 well

印支-早燕山期, 奥陶系、下寒武统天河板组-水井沱组、上震旦统烃源岩处在生油、气高峰期, 河捞子构造处于巴东-宣恩斜坡的高部位, 有利于油气的聚集; 下寒武统石龙洞组、上震旦统储集岩由于晚

成岩作用而形成的构造裂隙、埋藏溶孔, 成为此时油气运聚的良好储集场所, 纵向上形成良好的成油气组合, 即以下寒武统为区域盖层的下部成油气组合和以志留系为区域盖层的上部成油气组合。虽然经历了印支期以后的多次构造活动, 但在志留系、下寒武统区域盖层的保护下, 构造活动的改造难以深入其中, 该井区原生油气藏可能深埋于地腹。

2.2 继承型油气藏

与原生油气藏比较, 继承型油气藏形成机理有较明显差异, 即在烃源岩生油、气高峰期, 未能形成相应的构造高部位。在整体封闭条件下, 静压难以驱动油气顺利进入储集体而富集成藏, 而是滞留于原岩母体中。后期的区域构造活动形成的各类以构造为主体的圈闭, 以及相应的各类微小破裂, 为此类等待运移、聚集的油气提供了聚集场所, 从而完成了现今继承型油气藏的成藏过程。咸 2 井钻于花果坪复向斜南部咸丰构造上, 印支-早燕山期生油、气高峰期时, 下震旦统烃源岩处于上覆下寒武统区域盖层之下(图 3), 纵向上形成良好成油组

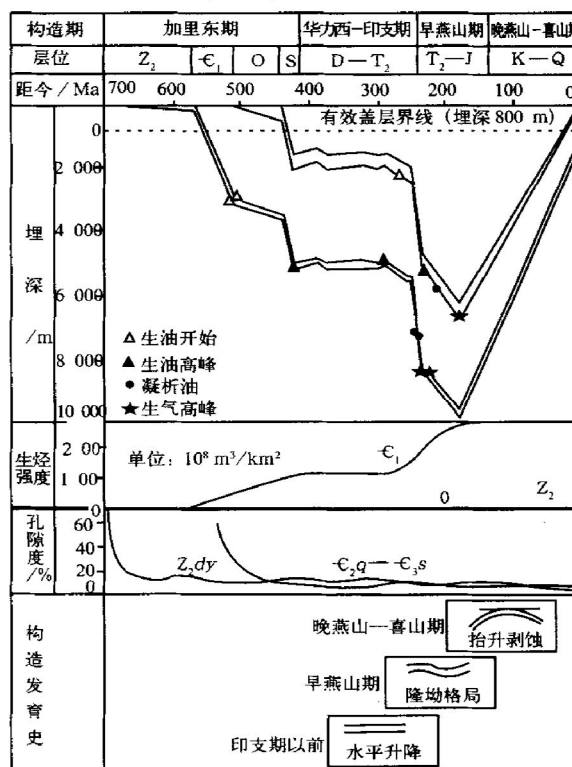


图 3 咸 2 井继承型油气藏成藏系统图

Fig. 3 Pool-forming system showing an inherited oil and gas reservoir in Xian No. 2 well

合, 但区域古构造位置相对咸 2 井区处于利川-咸丰斜坡的下部, 对油气的运移、聚集形成较为不利。

深埋状态下,整体封闭条件始终保持良好,直到早燕山期大规模区域挤压褶皱,现今构造面貌形成,这种较好的整体保存条件仍没丧失。这时褶皱形成,弥补了先期区域构造条件配置关系的不足,使得在新的环境下,原生油气源得以运移并相对富集成藏。

2.3 重建型油气藏

重建型油气藏是指构成油气成藏条件的各项地质因素经显著改造后,在新的平衡状态下形成的一类全新的油气成藏类型。

这种重建型油气藏,与前二类油气藏相比,其显著特点是油气源并非直接来自于原始烃源岩,而是由聚集的油气藏遭破坏后的再次分配或尚未聚集的次生油气源在新的封闭保存条件下的重新组合,储集层的主要储集空间以后期的原生储集体为主,圈闭亦是后期构造活动的产物。后期构造活动既是先存油气藏的破坏者,又是重建型油气藏形成的建设者。宜3井钻于宜都-鹤峰复背斜宜都构造,志留系、下寒武统有效盖层形成期早于烃源岩生油、气高峰期;印支-早燕山期,宜都-鹤峰斜坡高部位的奥陶系、下寒武统天河板组-水井沱组、上震旦统烃源岩处于生油、气高峰期(图4),有利于油气的聚集;下寒武统石龙洞组、上震旦统储集岩由于晚成岩作用而形成的构造裂缝、埋藏溶孔,成为此时油气运聚的良好储集场所,纵向上形成良好的成油气组合,即以下寒武统为区域盖层的下部成油气组合和以志留系为区域盖层的上部成油气组合。晚印支-早燕山期较大规模区域性构造活动,导致原生型油气藏的肢解或破坏。其中一部分因剥蚀而丧失,一部分因浅埋而渗漏,残存的次生油气源在新的成油气组合条件下形成次生油气藏的残余部分。这种残留油气,在燕山期大规模推覆作用下,将成为晚期圈闭条件下的主要油气源,并可能新的区域构造环境下,形成重建型油气藏。

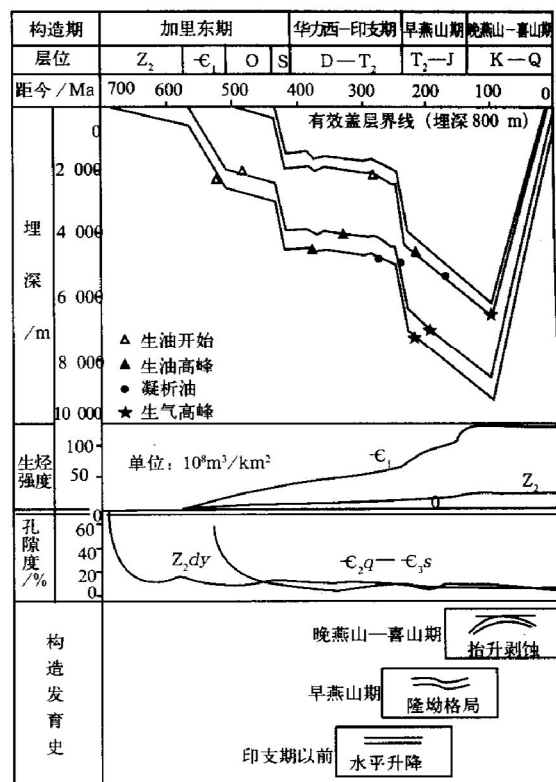


图4 宜3井重建型油气藏系统图

Fig. 4 Pool-forming system showing a reconstructive oil and gas in Yi No. 3 well

3 勘探方向

湘鄂西地区油气勘探只有针对构造改造程度弱和古构造位置有利的地区才能寻找到油气藏。花果坪复向斜中北部、桑植-石门复向斜中部,构造改造程度弱,上、下成油组合完整,处于古构造位置的斜坡上,有利于形成原生型油气藏;花果坪复向斜南部以及桑植-石门复向斜西部,构造改造程度弱,上、下成油组合完整,但处于古构造斜坡的下部,适宜寻找继承型油气藏;宜都-鹤峰复背斜中部、中央复背斜,上部成油组合因受构造运动强烈改造志留系盖层被剥蚀,仅存下部成油组合,以寻找重建型油气藏为主。

OIL & GAS RESERVOIR TYPES IN THE WESTERN REGION OF HUNAN AND HUBEI AND EXPLORATION ORIENTATION

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Abstract: Located at the slope of an ancient structure, the weak reformation of the structure in the north central part of Huaguoping composite syncline in the region of Hunan, western Hubei and the central part of Sangzhi-Shimen

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岩储集层油水界面[J]. 石油勘探与开发, 1998, 25(2): 24~ 26

APPLICATION OF ORGANIC CHEMISTRICAL METHOD IN DISCRIMINATING OIL- WATER STRATA IN TARIM CARBONATE ROCKS

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Abstract: When oil content saturation in carbonate rock reservoirs is > 50%, it is called oil layer; when oil content saturation is < 10%, it is called water layer. In terms of medium oil, oil bearing rate in rock cores of carbonate rock and rock porosity can be gained by employing rock pyrolysis and interpretation of electrical logging, by calculating visible oil content saturation in the rocks and then reservoir nature can be discriminated. Visible saturation in light oil has no real meaning to discriminate reservoir nature. The discrimination of oil- water strata are mainly based on the gas chromatographic characteristics from organic solvent extractions. Oil- water layers discriminated in Tarim basin with this method have been proved by well drilling.

Key words: carbonate rock; reservoir; organic geochemistry; visible oil content saturation; Tarim basin

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Cretaceous, forming three sets of oil and gas systems of Pinghu Formation Huagang Formation, Huagang Formation and Eocene, the former two sets are – known systems, the latter system is a conjectured one. Hydrocarbon source rocks in these two systems are in the stage of maturation. The closure of oil and gas bearing roof rocks in Huagang Formation deteriorates from southward towards northward and the south part with real meaning for oil and gas exploration. Comprehensive analyses indicate that the key moment for oil and gas bearing system in Pinghu Formation and is about 7 Ma, oil and gas bearing system in Huagang Formation is about 1.64 Ma.

Key words: oil and gas bearing system; distribution; key moment; Xihu lake depression; East China Sea

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composite syncline is a favorable region for exploring a primary oil and gas reservoir. Located below the slope of the ancient structure, the weak reformation of the structure in southern Huaguoping composite syncline and western Sangzhi – Shimen composite syncline is expected to find an inherited oil and gas reservoir. Only a reconstructive type oil and gas reservoir can be found in the remaining lower part of the oil and gas generation assemblage in the center of Yidu – Hefeng composite syncline and the upper part of the oil and gas generation assemblage of the central composite syncline due to intensively reformed by the tectonic movement and the Silurian roof rock being eroded.

Key words: oil and gas reservoir; type; structure activity; exploration orientation; western Hunan– Hubei