IOSR Journal of Engineering (IOSRJEN) **ww.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 05, Issue 10 (October. 2015), ||V1|| PP 29-33

The stratum characteristic and era of Ying cheng formation of the Cretaceous in Songliao Basin

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Abstract：In the Songliao Basin of China is well-developed Cretaceous stratigraphy.Although the system of lithology stratigraphy has been established,the dispute is mainly caused by chronostratigraphy system.The Rehe Biota growth period in Early Cretaceous with the distinct regional character.Plant fossils such as Ruffordia goeppertii,Acanthopteris gothanii,Coniopteris burejensis,Arctoperis rarinervis et al.and,a spot of angiospermae fossils such as Clavatipollenites,Polyporites,Tricolpopollenites et al have been obtained from Yingcheng Formation,they are Early Cretaceous.LA-ICPMS and Shrimp zircon ages of volcanic rock samples from Yingcheng range from101.4±1.9Ma-113.8±1.5Ma,falling into the Late Aptian to Middle Albian stage.

Key words: *Songliao Basin, Cretaceous, Yingcheng Formation, Stratigraphy*

Songliao basin is a large Mesozoic Cenozoic continental petroleum deposit basin in Northeast China.[1], its Cretaceous has been regarded as the standard profile of continental Cretaceous in China.The sedimentary structures in the basin are the Cretaceous volcanic rocks, the volcaniclastic rocks, the river and the lake facies sand mudstone, which are as thick as 9000m.In recent years,with the rapid development of the geophysical technology and the improvement of the rock formation and isotopic dating analysis, it has been an important breakthrough in the Yingcheng Formation[2-10],In view of this,this article to the Jehol Biota with time significance important fossils as a starting point, systematic summary of the Yingcheng Formation geological characteristics,system calibration Songliao Basin sedimentary cover layer geological era provides a scientific basis.

I. STRATIGRAPHIC DEVELOPMENT CHARACTERISTICS AND REGIONAL CHANGES

The tectonic evolution of the Songliao basin has undergone four major stages of geological evolution, namely,the faulted period,fault-depressed diversionary period,depression period,atrophy phase,and formed a unique combination of sedimentary types[11].The faulted period formation distribution are obviously controlled by the basement fault and deep fault, spread in more than 30 separate small fault basin.One of the important characteristics of the sedimentary filling in faulted period is the development of volcanic rock and volcaniclastic rock,complex sedimentary filling sequence of the formation of volcanic rock,alluvial fan, fan delta, lacustrine delta and alluvial plain[12].

The [1]faulted preiod formation of Songliao Basin include Huoshiling formation and Yingcheng Formation, Shahezi Formation.Yingkou formation in the basin within the various rift zone are almost [2]distributed,but lithology,lithofacies and stratigraphic thickness are different,in general, mafic basalt, neutra andesite,acid rhyolite and volcaniclastic rock are based,deposition of alluvial fan, fan delta, shore-shallow

lake, semi-deep lake and deep lake facies sandy conglomerate,sand mudstone are also developed.Although different researchers put forward a variety of classification schemes for the segmentation of the Yingcheng Formation[5,12-15],but the two sets of volcanic rocks are recognized in the Yingcheng Formation.The upper part of Yingcheng volcano rock formation is dominated by neutralbasalt,base basalt,andesite-basalt and andesite,which mixed with rhyolite.To the south, Wangjiatun and Shengping area, evolved to neutral andesite and acidic rhyolite as the main cause,to Xujiaweizi area, the acid rhyolite, rhyolite tuff, rhyolitic horny conglomerate constitute main part of the local volcanic formation of subject.Sandy conglomerate and clastic rock formation in the central area of Yingcheng Formation have a certain distribution in Anda,and the distribution of sandy congolomerate in the top of Yingcheng Formation is relatively stable,Wangjiatun,sorthen Shengping and Xujiaweizi area have the distribution,especially developed in Xujiaweizi area.

II. FOSSIL ASSEMBLAGE CHARACTERISTICS AND ITS TIME

Ostracoda, leaves conchostracan, ditch Isochrysis galbana, Charophytes,sporo pollen,spores and plants and a multi fossils are exist in Cretaceous, Songliao basin,their form with a strong local color of the Jehol biota, Sungari biota and Mingshui biota.This is an important reference for the division and correlation of the stratigraphic division of the basin[16].And Yingcheng Formation developed typical biota fossils,such as Lycoptera, eosestheria and so on, characterization for the Jehol Biota cluster evolution prosperous period.This study shows that the fossil plants in Yingcheng Formation are the most abundant, and there are a small amount of the conchostracon, ostracoda and insect.The ostracod fossils are found in the southeast of the basin,such as Cypridea sp,Triangulicypris ex.gr.Torsuosus,etc.The conchostracon fossils,such as Cratostracus sp, Migransia lishuensis,M.Jilinensis,Zhestheropsis elongata,Z.Dongbeiensis,Orthestheria sp,etc.The fossil plants,such as Equisetum cf. ramosus, Lycopodites cf. marylandicus, Coniopteris burejensis, C.saportana, C.onychioides, Acanthopteris gothani,Ruffordia goepperti, Nilssonia schaumburgensis, N.cf.densinervis, N.nipponensis, Neozamites verchojanensis, Ginkgo huttoni, Ginkgoites sibiricus, Elatocladus manchurica, etc.

Gao Ruiqi,et al,think that Shahezi Formation and Yingcheng Formation are mainly produced Ruffordia goeppertii，Acanthopteris gothanii，Coniopteris burejensis，Arctoperis rarinervis etc fossil plants,and it is classified as Ruffordia-Onychiopsis flora.Li Xingxue et al. put then into 2 combinations,Pteridiopsis-Nilssonia sinensis combination(Shahezi Formation or the bottom of Yingcheng Formation) and Neozamites-Ginkgo(middle and upper part of Yingcheneg Formation) combination.The flora fossil in the northeast of China and Russia, Siberia, the Lena basin, bureya basin and Japan,the icinoshiro subsets in the early Cretaceous strata are widely distributed[17-18],representative of the warm and humid climate conditions of the seasonal variation of the "North type" flora[18].Gao Ruiqi[19],et al, think the Yingcheng Formation belongs to the Early Cretaceous.At the same time, Yingcheng Formation also produced a small amount of angiosperm pollen fossil:Clavatipollenites， Polyporites and Tricolpopollenites[20-21],et al,Clavatipollenites often appear in Barremian-Albian formation of the notrh of latitude about 38 degrees,China,and Polyporites is frequently found in the Albian stage in the Northeast China[18].That it has entered the era of the late Early Cretaceous.

III. TIME STRATIGRAPHY

Shu Ping[22],et al, used Shrimp method to study the volcanic rocks of the Qingshen gas field in the Songliao basin.The 3 samples' age of Yingcheng Formation's volcano rock isotope Shengping area value is in the range of 113.0±0.8Ma~112.0±0.9Ma,the isotopic ages of the volcanic rocks in the 6 samples from Xingcheng area were 115.1±1.2Ma ~ 111.1±0.9Ma.The zircon Shrimp age of 9 volcanic rocks in Yingcheng Formation of the Qing Shen gas field is the maximum of 115.1±1.2Ma and the minimum value is 111.1±0.9Ma,the Shrimp ages of the 8 samples are all less than 113.0Ma.Wang Pujun,et al,use age analysis of

K-Ar and Ar/Ar in the volcanic rocks of the Yingcheng Formation,the age limit of the top of Yingcheng Formation is 113Ma, and the results are basically consistent with the above findings.

In the course of the study,determine the age of Songliao basin exploration strata in the volcano rocks with clastic zircon LA-ICPMS method and Shrimp method(Tab 1).The weighted average age range of theYingcheng Formation is 101.4±1.9Ma-113.8±1.5Ma,the age of main peak is 105-112Ma.The isotopic age of the volcanic rocks and volcaniclastic rock indicates that Yingcheng Formation is late Aptian-Albian.

Tab.1 Cretaceous volcanics isotope dating result of zircon from Yingcheng formation in Songliao Basin

Serial Number	**Well Number**	**Samples Buried Deep(m)**	**Horizon**	**Rock Type**	**Test Method**	**Weighted average age（Ma）**
1	Dashen1	3283.66	Yingcheng Formation	Rhyolitic ignimbrite	LA-ICPMS	101.4±1.8
2			Yingcheng Formation	Rhyolitic ignimbrite	SHRIMP	102.2±2.1
3		3509.7	Yingcheng Formation	Andesite	LA-ICPMS	105.0±3.0
4	Shengshen202	2895.19	Yingcheng Formation	Rhyolitic	LA-ICPMS	103.7±1.1
5		3142.43	Yingcheng Formation	Pyromeride	LA-ICPMS	106.5±2.5
6	Songshen2	3188.42	Yingcheng Formation	Andesite	LA-ICPMS	107.1±4.5
7	Xushen1-2	3690.06	Yingcheng Formation	Tuffaceous ignimbrite	LA-ICPMS	105.3±1.1
8			Yingcheng Formation	tuffaceous ignimbrite	SHRIMP	106.9±2.7
9	Xushen4	3585.78	Yingcheng Formation	Rhyolitic Crystal Tuff	LA-ICPMS	103.5±3.3
10		3986.42	Yingcheng Formation	Rhyolitic	LA-ICPMS	106.5±0.8
11	Suishen1	1895.97	Yingcheng Formation	Hornblende andesite	LA-ICPMS	105.4±2.4
12		1974.91	Yingcheng Formation	Biotite andesite	LA-ICPMS	107.7±2.0
13		2212.3	Yingcheng Formation	Andesitic welded tuff	LA-ICPMS	111.3±1.3
14			Yingcheng Formation	Andesitic welded tuff	SHRIMP	114.0±3.0
15	Ren11	1562.38	Yingcheng Formation	Altered andesite	LA-ICPMS	107.9±2.3
16		1802.46	Yingcheng Formation	Andesite	LA-ICPMS	113.8±1.5

17			Yingcheng Formation	Andesite	SHRIMP	112.1±3.5
18		1970.83	Yingcheng Formation	Altered andesite	LA-ICPMS	109.4±1.5
19			Yingcheng Formation	Altered andesite	SHRIMP	109.2±2.1

IV. CONCLUSION

The Yingdcheng Formation has a wide distribution in the basin, which is almost all over the faulted zone,but lithology, lithofacies and stratigraphic thickness are different,a combination of two sets of volcanic rocks, volcaniclastic rocks and two normal sedimentary rocks.Goeppertii Acanthopteris, gothanii Ruffordia, burejensis Coniopteris, rarinervis Arctoperis, and other plant fossils were produced in Yingcheng Formation.At the same time, a small amount of angiospermous pollen,such as Clavatipollenites， Polyporites and Tricolpopollenites,etc.Indicates that the time has been extended to the Albian age.The weighted average age range is 101.4±1.9Ma~113.8±1.5Ma by the LA-ICPMS method and Shrimp method in Yingcheng Formation.Further confirmed its age for the late Aptian period-in the Albian period.

REFERENCE

[1]. Yang Wanli.Petroleum Geology In Songliao Continental Basin [M].Beijing: Petroleum Industry Press, 1985: 228-229.

[2]. Wang Defa, Chen Jianwen, Zhang Xiaodong,et al.In Yingcheng volcano facies and volcano mechanism analysis of Xujiaweizi Songliao Basin[J].Earth Science Frontiers,2000,7(4):371-379.

[3]. Chen Qingchun, Zhu Dongya, Hu Wenxuan,et al.Classification and Characteristics of Oil and Gas Reservior Beds of Volcanic Rocks [J].Geological Review,2003,49(3):286-291.

[4]. Wang Pujun, Chi Yuanlin, Liu Wanzhu, et al.Volcanic Facies of The Songliao Basijn:Classification, Characteristics and Reservior SignIficance**[**J],Journal of Jilin University (Earth Science Edition), 2003, 33 (2): 454-449.

[5]. Ren Yanguang,In the geological features and natural gas accumulation in Xujiaweizi fault of Songliao Basin[D].Jilin University doctoral dissertation, 2004:76-87.

[6]. Feng Z Q .Volcanic rocks as prolific gas reservoir ： A case study from the Qingshen gas field in the Songliao basin[J] .NE China.Marine and Petroleum Geology,2008,25:416-432.

[7]. Zhang Wenjing, Ren Yanguang, Chen Junliang, et al.Characteristic of compress deformation of Xujiaweizi Rift in Songliao Basin[J].Daqing Petroleum Geology & development, 2008,27 (4): 21-29.

[8]. Pang Yanming, Chen Bingfeng, Yang Shuangling, et al.3D geologic modeling technology for the volcanic reservior of Yingcheng Formation in the Xushen Gasfield ,Songliao Basin[J].Chinese Journal of Geology,2009,44(2):759-768.

[9]. Feng Zihui, Zhu Yingkang, Zhang Yuangao, et al.The seismic response of the volcanic edifice-facies zone of Yingcheng Formation in the Songliao Basin[J].Chinese Journal of Geopysics, 2010,53(2):556-562.

[10]. Han Gang, Ren Yanguang, Zhang Wenjing, et al.Volcanic rock reserviors mechanism in North Songliao Basin Xujiaweizi Fault Depression[J].Progress in Geophysics, 2011,26(6):2114-2121.

[11]. Huang Qinghua, Wu Huaichun, Wan Xiaoqiao, et al.New progress of integrated chronostratigraphy of the Cretaceous in Songliao Basin[J].Journal of Stratigraphy, 2011,35(3):250-257.

[12]. Liu Zhaojun, Wang Dongpo, Liu Li, et al.Sedimentary Characteristics of The Cretaceous Songliao Basin [J]. ACTA Geologica Sinca, 1992,66 (4): 327-337.

[13]. Jilin regional stratigraphic table Compilation Group.Regional stratigraphic table in Northeast China-Jilin province [M]Beijing: Geological Publishing House,1978:72-76.

[14]. The editorial board of "Stratigraphic Lexicon of China''.Stratigraphic Lexicon of China-Cretaceous [M]. Beijing: Geological Publishing House, 2000:98-99.

[15]. Ren Yanguang, Zhu Defeng, Wan Chuanbiao, et al.Deep geological characteristics and exploration direction of natural gas in northern Songliao Basin[J].Petroleum geology, 2004 (4):12-18.

[16]. Huang Qinghua, Zhang Wenjing, Jia Qiong, et al.Division of upper and lower Cretaceous boundary in Songliao Basin [J].EARTH SCIENCE FRONTIERS,2009,16(6):77-84.

[17]. Zhang Ying, Gao Ruiqi, Cui Tongcui.Cretaceous petroleum formation in Songliao Basin[M].Beijing: Petroleum Industry Press, 1994:183-234.

[18]. Li Xingxue.One of the first discovered species of the Cretaceous deposits in China-Trapa? microphylla Lesq [J]. Journal of Ancient Biology, 1959,7 (1): 33-40.

[19]. Gao Ruiqi, Zhao Chuanben, Qiao Xiuyun, et al.The Songliao Basin oil stratigraphic palynology of Cretaceous[M].Beijing: Geological Publishing House, 1999:55-69.

[20]. Wang Shuying.Sporopollen assemblage of Yingcheng Formation in Jilin Province[J].Journal of Stratigraphy, 1989, 13 (1): 34-39.

[21]. Wan Chuanbiao, Qiao Xiuyun, Kong Hui, et al.Early Cretaceous Sporo-Pollen Assemblages in Heilongjiang Bei'an area [J].Acta Micropalaeontologica Sinica,2002,19(1):83-90.

[22]. Shu Ping, Ding Rixin, Ji Xueyan, Qu Yan Ming.SHRIMP zircon geochronology of reservoir volcanic rocks in the Qingshen gas field,Songliao Basin [J]. ACTA PETROLOGICA ET MINERAOLOGICA, 2007, 6(3): 239-246.