1 Introduction
The organic-rich shale in Lower Silurian Longmaxi formation Sichuan Basin is marine sedimentary strata, and it has large thickness and rich resources. Therefore, it is one of the most important parts in unconventional oil and gas reservoir exploration. Eastern Sichuan area is located in high and deep structural belt, so influenced by the factors of deep-buried structure, intense transformation and fault development, organic-rich shale belts’ distribution is unclear (Fig.1).

2 Research of Sedimentary Facies
Analysed are the color, mineral composition, texture, structure, and biological characteristics of rock in study area of Longmaxi formation (Fig.2), and classified the rock as siltstone, mud(shale), carbonate, and contourite. Combining with the characteristics of the color, sedimentary structure, paleontology, and electrical property of rock, classified in the study area into 9 lithofacies: dark grey lamellar silty mudstone, dark grey massive silty mudstone, grey-dark(lime green) lamellar mudstone, grey-dark(lime green) massive mudstone, fossil-bearing mudstone, black graptolite mudstone, grey massive argillaceous siltstone, grey lamellar argillaceous siltstone, and grey contourite(Liu et al., 1994). The first 6 lithofacies are organic-rich, which are the most conducive to the accumulation of shale, and they mainly distributed in 30~120m interval near the bottom of lower Longmaxi formation.

According to the macro-analysis, micro-analysis, and special-analysis derived from the core-drilling, and combining with the regional geological data, the study results show that 2 subfacies with 6 microfacies are clarified in the study area of Longmaxi formation(Guo et al., 2004; Liang et al., 2009), including Calcareous Silty Shelf, Muddy Silty Shelf, Muddy Limy Shelf in the Inner Shelf, and Silty Muddy Shelf, Muddy Shelf, Contour Current in the Outer Shelf(Fig.2, Fig.3). The organic-rich shale belongs to the Outer Shelf environment, vertically distributed in bottom of Longmaxi formation upper and lower intervals in the whole study area, and laterally distributed near Longchang-Yongchuan, in the Southeast of Lingshui-Wuxi, and in the north of Changshou-Qianjiang. The Outer Shelf is the most conducive to the generation and accumulation of shale gas.

3 Character of High-Quality Shale
According to the research of organic geochemistry and
reservoir characters, Lower Silurian Longmaxi formation was formed in reducing environment with deep-water and low-energy, beneath the normal wave base. There is a large number of zooplankton and Phytoplankton (Wang et al., 2009; Chen et al., 2014; Soua et al., 2014). A long-term reducing environment deposit and preserve an abundant organic matter. The organic matter from biopelite in the bottom of lower interval of Longmaxi formation, with its large content (the average of TOC 2.12%), its high maturity (the average of Ro 2.35%), and its thick strata (17~146m), containing an abundant type of organic matter (More I type) and a large variety of reservoir space, provide that the condition of the biopelite is conducive to form shale reservoir (Fig.4) (Wang et al., 2009; Wan et al., 2012; Guo et al., 2014). In addition, brittle minerals contained over 40 percentage in the shale strata and growing micro-pore and micro-crack with the function of tectonic stress, provide a breeding ground for shale gas deposit as well as a favorable condition for shale gas fracking (Curtis, 2002).

4 Conclusions

(1) The Lower Silurian formation in the study area is
divided into 9 lithofacies, among which, dark grey lamellar silt mudstone, dark grey massive silt mudstone, grey-dark(lime green) lamellar mudstone, grey-dark(lime green) massive mudstone, fossil-bearing mudstone, and black graptolite mudstone are the lithofacies with richest organic, which are the most conducive to the accumulation of shale gas. The study results from Lower Silurian formation shows that 2 subfacies and 6 microfacies are clarified, especially Silt Muddy Shelf, Muddy Shelf, Contour Current in the Outer Shelf is conducive to the accumulation of shale gas.

(2) Lower Silurian Longmaxi formation was formed in a reducing environment of deep-water and low-energy, which possesses the characteristics of abundant organic matter, high maturity, various reservoir space, high thickness of strata, most I type kerogen, and high content of brittle mineral, are the favorable conditions for the accumulation of shale gas.

References