AAPG Datapages/Search and Discovery Article #90234 © 2015 AAPG Asia Pacific Region, Geoscience Technology Workshop, Opportunities and Advancements in Coal Bed Methane in the Asia Pacific, February 12-13, 2015, Brisbane Australia

The Endogenetic Fracture Characteristic and its Indication on Permeability of Coal Seam 2 Reservoir in Yanchuannan CBM Field, Southeastern Ordos Basin, China

Shihui Hou[1], Xiaoming Wang[1], Xingjin Wang[123], Sidong Pan[1], and Min Wu[1]

[1]Faculty of Earth Resources, China University of Geosciences, Wuhan, Hubei, China
[2]University of Queensland
[3]Austar Gas Pty Ltd., NSW

Abstract

The endogenetic fracture characteristics of coal reservoir have an important indication on the permeability, which is one of the key geological factors to determine the CBM well production during the process of CBM exploration and development. The study area, Yanchuannan CBM field, is located in southeast of Ordos Basin, the joint between Jinxi ply belt and Shanbei slope. Coal seam 2 reservoir of Shanxi formation in the field was chosen to carry out the research in this paper.

Combined with the sufficient geological data, lump coal samples from adjacent coal mine and parametric boreholes core were collected for polished sections, which were used to discriminate patterns of endogenetic fracture in vertical planes and horizontal planes, respectively. The endogenetic fracture observation performed on the polished section of the coal sample is consisted of macroscopic observation and optical microscope microscopic observation following the Chinese Standard Method MT/T 968-2005.

The influence of endogenetic fracture characteristics on permeability was analyzed based on qualitative description and/or quantitative characterization of endogenetic fracture parameters, which included density, aperture, crosscutting relationship and mineral filling characteristics. Through research, it is concluded that:

1) The endogenetic fracture of coal seam 2 reservoir, terminated by fusinite (Fig. 1) and/or dirt band (Fig. 2), is mainly controlled by coal type.

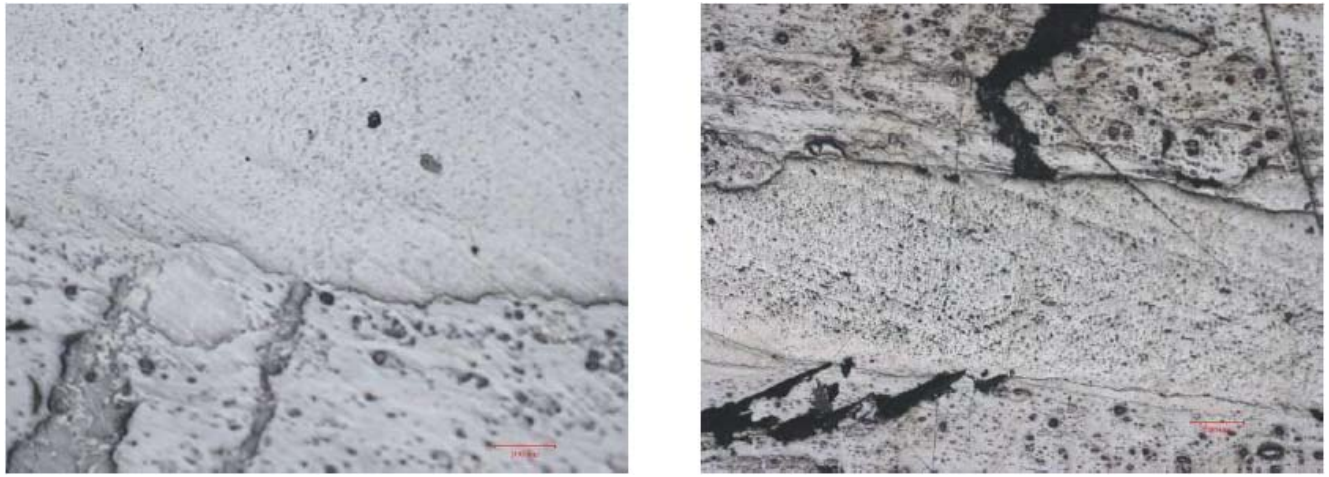

Fig. 1. The endogenetic fracture terminated by the fusinite 10×*10×.

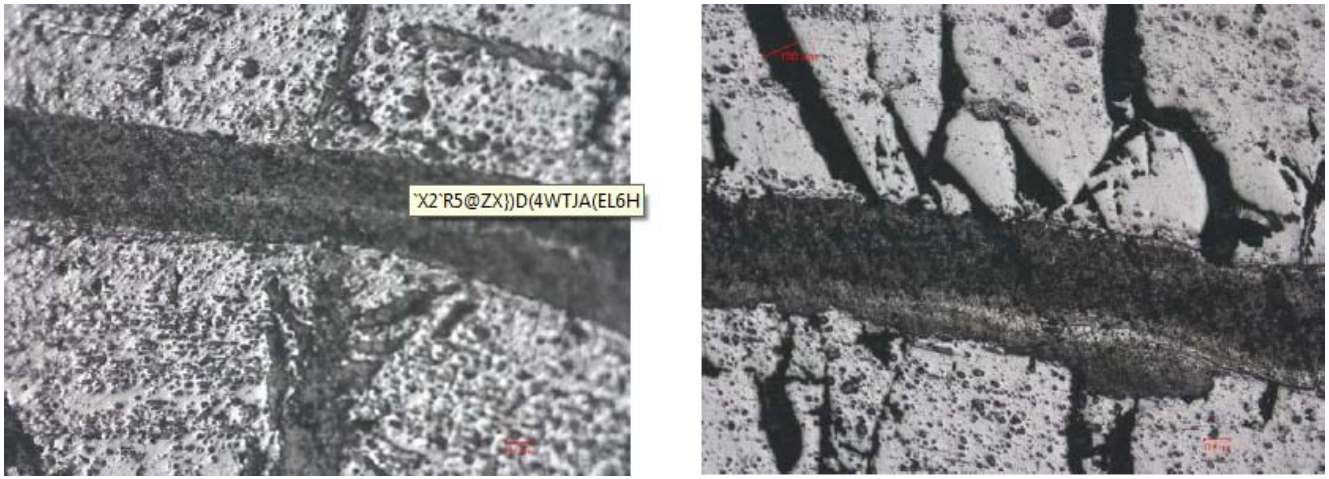

Fig. 2. The endogenetic fracture terminated by the dirt band 5×*10×.

2) According to mineral filling characteristics of coal seam 2 reservoir in Shanxi formation, the endogenetic fracture is divided into two types: the filled fracture and the unfilled fracture. From the fact that unfilled fracture terminates in filled fracture, it can be concluded formation stage of unfilled endogenetic fracture is later than that of filled endogenous fracture. Filling mineral types of endogenetic fracture are mainly calcite and pyrite. Pyrite can fill the endogenous fissure completely (Fig. 3), which would lead to obvious permeability reduction. While calcite cannot

fill the endogenetic fissure completely, that is, there exists a specific spacing between coal maceral and calcite (Fig. 4). Thus, the calcite has a relatively small effect on coal reservoir permeability.

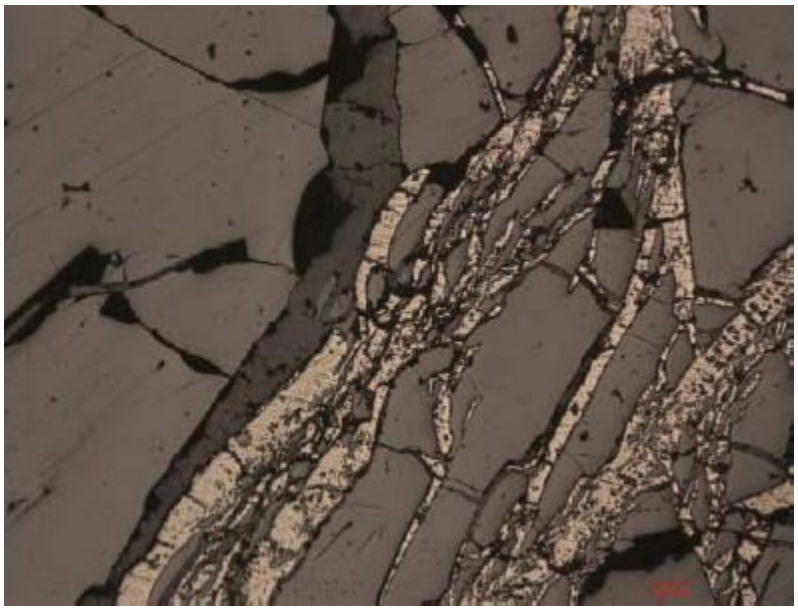

Fig. 3. Pyrite filling characteristic.

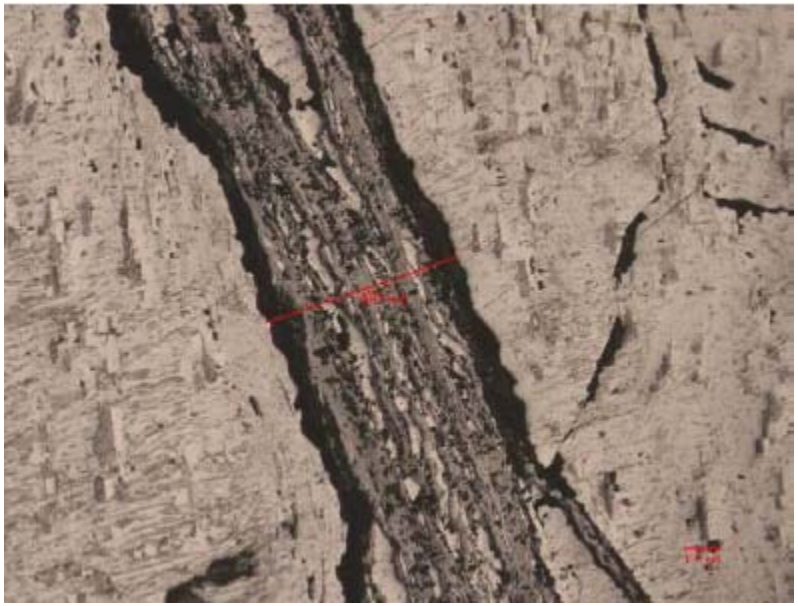

Fig. 4. Calcite filling characteristic.

3) The development patterns of endogenetic fracture of coal seam 2 reservoir include vertically, thick vitrain type, interbeds of striated vitrain and clarain type, and integrated type. The thick vitrain type, with parallel or interconnected fracture, main contains thicker vitrain and thicker clarain; the interbeds of striated vitrain and clarain type, with fracture in isolation pattern or irregular but connective network pattern, develops striated vitrain, striated clarain and thicker clarain; The characteristics of integrated type include that of thick vitrain type, interbeds of striated vitrain and clarain type. It can be concluded from table 1 that fracture density of these three types is similar; however, fracture aperture varies apparently. From large to small in turn, the three types is thick vitrain type, integrated type, interbeds of striated vitrain and clarain type, so does the reservoir permeability.

Type	Filled endogenetic fracture			Unfilled endogenetic fracture		
	Average density	Aperture	Average aperture	Average density	Aperture	Average aperture
	fracture/cm	μm	μm	fracture/cm	μm	μm
thick vitrain	1.7	128～925	412	4.6	20～296	137
nterbeds of striated vitrain and clarain	2.0	59～463	194	5.0	10～510	107
integrated	2.05	109～828	384.5	**	28～425	96

** Not be easily measured

Table 1. Parameters of the patterns of endogenetic fracture in vertical.

4) The patterns of endogenetic fracture of coal seam 2 reservoir are of, horizontally, regular reticular type, irregular reticular type and isolated type, according to filled endogenetic fracture characteristics. The endogenetic fracture density and the endogenetic fracture aperture of the regular reticular type and irregular reticular type have no obvious difference (Table 2) while endogenetic fracture connectivity related to reservoir permeability is different apparently. The regular reticular type, with the best connectivity, possesses good permeability while the isolated type owns bad permeability because of worst connectivity though the average aperture of the unfilled endogenetic fracture in isolated type is significantly greater than that of the other types. So the permeability of the irregular reticular type falls in between the others.

Type	Filled endogenetic fracture			Unfilled endogenetic fracture		
	Average density	Aperture	Average aperture	Average density	Aperture	Average aperture
	fracture/cm	μm	μm	fracture/cm	μm	μm
regular reticular	1.43	128～925	160	1.73	8～228	44
irregular reticular	1.9	24～552	198	**	6～349	56
isolated	**	75～217	141	**	250～327	286

** Not be easily measured

Table 2. Parameters of the patterns of endogenetic fracture in horizontal.