Original article

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PII: S1319-562X(16)30112-7
DOI: http://dx.doi.org/10.1016/j.sjbs.2016.09.014
Reference: SJBS 774

To appear in: *Saudi Journal of Biological Sciences*

Received Date: 25 June 2016
Revised Date: 1 September 2016
Accepted Date: 3 September 2016

Please cite this article as: M. Yue, W. Zhu, Z. Song, Y. Long, H. Song, Study on distribution of reservoir endogenous microbe and oil displacement mechanism, *Saudi Journal of Biological Sciences* (2016), doi: http://dx.doi.org/10.1016/j.sjbs.2016.09.014

Study on distribution of reservoir endogenous microbe and oil displacement mechanism

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Abstract In order to research oil displacement mechanism by indigenous microbial communities under reservoir conditions, indigenous microbial flooding experiments using the endogenous mixed bacterium from Shengli Oilfield were carried out. Through microscopic simulation visual model, observation and analysis of distribution and flow of the remaining oil in the process of water flooding and microbial oil displacement were conducted under high temperature and high pressure conditions. Research has shown that compared with atmospheric conditions, the growth of the microorganism metabolism and attenuation is slowly under high pressure conditions, and the existence of the porous medium for microbial provides good adhesion, also makes its growth cycle extension. the microbial activities can effectively launch all kinds of residual oil, and can together with metabolites, enter the blind holes off which water flooding, polymer flooding and gas flooding can't sweep, then swap out remaining oil, increase liquidity of the crude oil and remarkably improve oil displacement effect.

KEYWORDS Endogenous microbes; Porous media; Displacement mechanism; Microbial communities; Microbial enhanced oil recovery

1. Introduction

Endogenous microbial enhanced oil recovery (ASMR, activation of stratal microflora recovery) refers to the use of the original formation of microbial communities, activation underground beneficial microbial communities by adding activator to degrade crude oil viscosity, increased mobility of crude oil to enhance oil recovery (Abdel-Waly, 1999; Lee et al., 1998; Zhang et al., 2005; Step et al., 1997; Wilhelms et al., 2005). Compared with exogenous microorganisms, endogenous microbes can adapt to extreme environmental reservoir, and has the advantages of high metabolic activity, no bacteria culture collections and production (Basso et al., 2007; Song et al., 2010; Li et al., 2006; Wang, 2002; Nazina et al., 2005; Ravin et al., 2009). However, the experimental study of microscopic microbial flooding currently defined at normal temperature and pressure conditions, most flooding during macro qualitative description of the process for the microbial enhanced oil reservoir simulation under high temperature and pressure conditions in porous media Microbial microscopic oil displacement experiments conducted also been reported(Simpson, et al., 2011; Borzenkov, 2004; Gray et al., 2009; Kaster et al., 2009), so many enhanced oil recovery mechanism has not yet been to identify and quantify. Therefore, based on the micro level, by simulating the reservoir temperature, high pressure environment, the use of micro-simulation models flooding experiment equipment and image acquisition system, using activated endogenous mixed microorganisms, microbial action on the various stages of the remaining oil in porous media changes in morphology and follow-up observations reveal microbial enhanced oil recovery characteristics under reservoir conditions, to clarify the mechanism of microbial microscopic flooding, provide reference for microbial enhanced oil field trials.

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