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Yue Ma, Shuyuan Li

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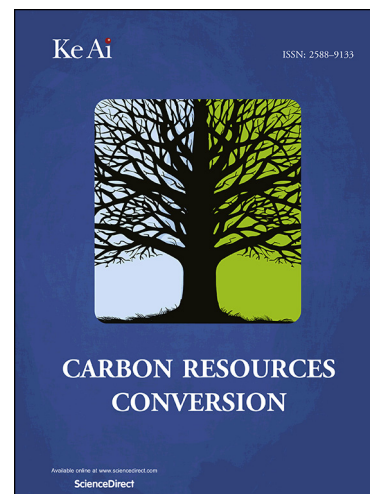
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# The mechanism and kinetics of oil shale pyrolysis at the presence of water

Yue Ma<sup>1</sup>, Shuyuan Li<sup>1\*</sup>

(1.State Key Laboratory of Heavy oil processing, College of Science, China University of Petroleum, Beijing 102249)

## Abstract:

The hydrous thermo-simulation experiments on oil shale sample from Liushuhe basin have been performed using autoclave. The mechanism and kinetics of oil shale pyrolysis were investigated. The formation mechanism of pyrolysates including retorting gas, oil and bitumen, were evaluated at the presence of saturated and unsaturated water, respectively. The results show that the physicochemical properties of water have greatly changed in high temperature and pressure. At the same time, water has three kinds of effect on the oil shale pyrolysis, including the protection of free radical, catalytic action and swelling. The pyrolysis temperature was carried out about 70°C earlier, and the generated processing of hydrocarbon would be easier under the aqueous. The consecutive first order reaction model involving bitumen as an intermediate product was used in the data analysis in order to determine the pyrolysis kinetic parameters. It was found that the apparent activation energy of kerogen pyrolysis was lower than bitumen pyrolysis.

**Key words:** oil shale; mechanism; free radical reaction; carbocation reaction; kinetics; aqueous medium

## 1. Introduction

Oil shale, a fine-grained sedimentary rock, often contains a proportionally large amount of mineral, kerogen and little bitumen, which can be converted into oil by thermal degradation<sup>[1]</sup>. The organic macromolecule, insoluble in ordinary solvents was called kerogen by petroleum geologists and geochemists. The kerogen can be converted into oil, gas and semi-coke by thermal degradation when the temperature

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\* Corresponding author. Tel: +86 01089733287; fax: +86 01089733419  
E-mail address: syli@cup.edu.cn (Shuyuan Li)

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