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Operational Conditions Effects on Iranian Heavy Oil Upgrading using Microwave Irradiation

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1 Operational Conditions Effects on Iranian Heavy Oil Upgrading 2 using Microwave Irradiation

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9 Abstract

10 Upgrading technology can be used to produce light petroleum from heavy crude oil. One
11 of the new approaches in this area is application of microwave heating. This method has
12 advantages in heavy crude oil upgrading processes. In this paper, the effective parameters
13 on upgrading Iranian heavy crude oil using microwave irradiation have been studied for
14 the first time. The investigated crude oil is from Iranian west Paydar field. The effects of
15 various parameters, including power level, process time, various additives such as amount
16 of sensitizer, and catalysts have been completely investigated. The performed tests to
17 assess the influences of the parameters include measurement final temperature, API,
18 asphaltene contents, viscosity, coke, and SARA experiment to determine the components
19 of asphaltenes , saturates, aromatics , and resins. According to the results for the samples
20 with no additives, radiation at low power levels has positive effects on oil characteristics.
21 There is also the optimal radiation time. Adding active carbon as microwaves sensitizer,
22 significantly improves the specification of oil; increases oil API, and decreases gravity and
23 its asphaltene contents. It also causes increasing in process time and power levels upgrade
24 the oil specifications. At the best conditions (power level, 50%; process time, 20 minutes;
25 activated carbon, 10 wt%; catalyst, 4 wt%), API, viscosity, and amount of asphaltenes
26 have been increased 17.56% and reduced 33.73% and 30.5%, respectively. In addition, the
27 results show that the iron catalyst is more desirable in comparison to the other catalysts.

28 **Keywords:** Heavy crude oil; Upgrading; Microwaves

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31 1. Introduction

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