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ONLINE ISSN : 1349-273X

PRINT ISSN : 1346-8804

Journal of the Japan Petroleum Institute

Vol. 47 (2004) , No. 2 pp.107-114



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Promotion of Catalytic Activities and Suppression of Deactivation by Water in the Hydrotreatment of Atmospheric Residue

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(Received: June 3, 2003)

Water was added to extend the continuous run of the atmospheric residue hydrotreatment process in bench plant and autoclave tests for improvement of catalyst life. Addition of water increased the catalytic activities for both hydrodesulfurization (HDS) and hydrodemetallization, and suppressed catalyst deactivation by reducing coke deposition on the catalyst surface. The effects disappeared after water addition was stopped resulting in increased coke formation. The remarkable effects of water addition were observed with both new and spent catalysts, but the amounts of deposited metals and coke were different. Effects of water addition are considered as follows. The addition of water is considered to accelerate the desorption of asphaltene in the feed and coke precursor produced during the reaction on the catalyst surface to extend the catalyst life. Water addition also increases the catalytic activity by accelerating the cycle of asphaltene adsorption and product desorption, resulting in increased catalytic turnover of HDS reactions on the active sites. The stripping roles of water are considered to reflect the high dissolving activity of high temperature, high pressure steam under HDS conditions.

Keywords: [Atmospheric residue](#), [Hydrotreating](#), [Water addition](#), [Hydrodesulfurization](#), [Hydrodemetallization](#), [Catalyst deactivation](#)



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Hiroshi Mizutani, Kazuyuki Kiriya, Kouichi Kondo, Kazuo Idei and Isao Mochida,
Journal of the Japan Petroleum Institute, Vol. **47**, No. 2, p.107 (2004) .

doi:10.1627/jpi.47.107

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