

## Hydrodenitrogenation of porphyrin on Ni-Mo based catalysts

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**摘要** The hydrodenitrogenation (HDN) of porphyrins was carried out over a series of phosphorus containing NiMo/Al<sub>2</sub>O<sub>3</sub> catalysts using a fixed-bed flow reaction system. A method of quantitative analysis of the porphyrin and its derivatives produced by HDN was established. In HDN of porphyrin, four types of hydrocarbons: C<sub>8</sub> alkanes, C<sub>8</sub> alkenes, C<sub>9</sub> alkanes, and C<sub>10</sub> alkanes, and two groups of nitrogen-containing compounds: alkyl substituted bipyrrrolidines (alkylbipyrrrolidines) and alkyl substituted tripyrrrolidines (alkyltripyrrrolidines) were identified. The hydrogenolysis of porphyrins occurred rapidly at lower temperature but higher temperatures were required for the HDN of porphyrins. The NiMoP3 catalyst showed the highest catalytic activity for the HDN of porphyrins. Based on the characterization of the supports and catalysts, it is suggested that the dispersion of Mo is improved and the number of weak acidic sites on the NiMoP catalysts increases with the addition of phosphorus.

**关键词:** [Hydrodenitrogenation](#) [Porphyrin](#) [Nickel molybdenum catalyst](#) [Phosphorus](#)

**Abstract:** The hydrodenitrogenation (HDN) of porphyrins was carried out over a series of phosphorus containing NiMo/Al<sub>2</sub>O<sub>3</sub> catalysts using a fixed-bed flow reaction system. A method of quantitative analysis of the porphyrin and its derivatives produced by HDN was established. In HDN of porphyrin, four types of hydrocarbons: C<sub>8</sub> alkanes, C<sub>8</sub> alkenes, C<sub>9</sub> alkanes, and C<sub>10</sub> alkanes, and two groups of nitrogen-containing compounds: alkyl substituted bipyrrrolidines (alkylbipyrrrolidines) and alkyl substituted tripyrrrolidines (alkyltripyrrrolidines) were identified. The hydrogenolysis of porphyrins occurred rapidly at lower temperature but higher temperatures were required for the HDN of porphyrins. The NiMoP3 catalyst showed the highest catalytic activity for the HDN of porphyrins. Based on the characterization of the supports and catalysts, it is suggested that the dispersion of Mo is improved and the number of weak acidic sites on the NiMoP catalysts increases with the addition of phosphorus.

**Keywords:** [Hydrodenitrogenation](#), [Porphyrin](#), [Nickel molybdenum catalyst](#), [Phosphorus](#)

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