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# L-III | Transmetal Sulfide Based Catalyst in Oxygen Removal of Coke Oven Gas (COG)

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Catalytic oxygen removal from a raw COG in the presence of multiple trace components is challenging. This study focuses on the evaluation of three catalyst systems provided by Clariant, namely Pt based, Co- and Nickel-molybdenum based catalysts. Up to now, the transmetal sulfide catalysts have been usually applied for hydrogendesulfurization process.<sup>[1]</sup>

#### METHODOLOGY

The performance of CoMo catalyst in removal of oxygen traces from a synthetic coke oven gas (COG) containing sulfur component, such as  $H_2S$ , is studied. Especially, the performance can be significantly improved by increasing pressure in the relatively high pressure range between 10 and 50 bar. The key parameter is the sulfidation pressure, which is identical to the reaction pressure, generating the sulfided active phase.

#### **STATE OF THE ART - Pt CATALYST**





Fig. 1: Commercial Catalysts produced by Clariant Produkte GmbH



Fig. 2: Pictorial representation of the content of Coke Oven Gas (COG)

**Fig. 3:** Catalyst poisoning study in the presence of  $H_2S$  (450 ppm): GHSV=20.000-22500 h-1; T=150-250 °C; p= 5-10 overpressure;  $c(O_2)=4500-9000$  ppm <sup>[2]</sup>

### NEW APPROACH - CoMo CATALYST



**Fig. 4:** Performances of the CoMo catalyst in the reaction pressure range between atm. and 50 bar; the highest oxygen removal level at 30 bar



#### References

- [1] Berhault et al. New Materials for Catalytic Applications, 2016, p. 313-360, DOI: 10.1016/B978-0-444-63587-7.00010-X
- [2] S. Suh, C. Geitner, M. Hänel, T. Wiesmann, C. Watermann, H. Lohmann,
  - U.-P. Apfel, B. Zeidler-Fandrich, Chem. Ing. Tech., 2022, 94,
  - DOI: 10.1002/cite.20200067

**Fig. 5:** Comparison between the Pt and CoMo catalyst regarding to the oxygen removal level: p= 5 bar; GHSV= 22.500 h-1, T=250 °C;  $c(H_2S) = 450$  ppm

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