

Accepted Manuscript

Title: *In Situ* X-ray Diffraction of Fischer-Tropsch Catalysts—Effect of Water on the Reduction of Cobalt Oxides

Authors: James Paterson, Mark Peacock, Ewen Ferguson, Manuel Ojeda, Jay Clarkson



PII: S0926-860X(17)30397-6
DOI: <http://dx.doi.org/doi:10.1016/j.apcata.2017.08.017>
Reference: APCATA 16372

To appear in: *Applied Catalysis A: General*

Received date: 14-6-2017
Revised date: 7-8-2017
Accepted date: 10-8-2017

Please cite this article as: James Paterson, Mark Peacock, Ewen Ferguson, Manuel Ojeda, Jay Clarkson, *In Situ* X-ray Diffraction of Fischer-Tropsch Catalysts—Effect of Water on the Reduction of Cobalt Oxides, *Applied Catalysis A, General* <http://dx.doi.org/10.1016/j.apcata.2017.08.017>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

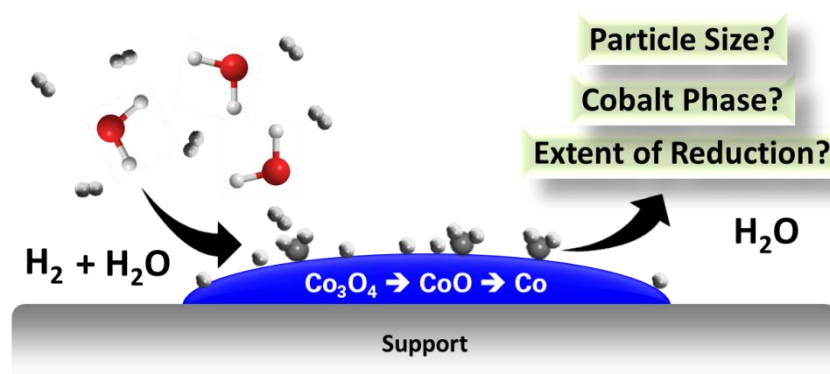
In Situ X-ray Diffraction of Fischer-Tropsch Catalysts – Effect of Water on the Reduction of Cobalt Oxides

James Paterson ^a, Mark Peacock ^a, Ewen Ferguson ^a, Manuel Ojeda ^a, Jay Clarkson ^b

^a BP, Saltend Chemicals Park, Hull, HU12 8DS

^b JM Process Technologies, Stockton, Teeside

Graphical abstract:



Highlights:

- In situ XRD to evaluate FT catalyst reduction with a water co-feed to understand water profiles in a fixed bed FT catalyst process and tracking changes to the species and temperatures where they form
- By using a range of water co-feed tests with in situ XRD we showed the inhibition of reduction by water for cobalt oxide to cobalt metal
- FT catalysis is shown with 2 different GHSV's during reduction where the water residence time is changed, showing significant changes to FT performance across 4 sections of the bed (top to bottom).
- The finds from this are applied to the BP-JM FT GTL commercial offer, where a decrease in selectivity from poor reductions will impact on commercial viability and catalyst life

Abstract: By using *in situ* X-ray diffraction, we were able to demonstrate the effect of H_2O on the reduction of cobalt oxide particles for Fischer-Tropsch Synthesis. Reduction of Co_3O_4 to Co via CoO in H_2 produces large quantities of water, which was thought to have an impact upon the reduction of the catalyst down a reactor bed. Bed profiles are produced from saturation of the bottom of the catalyst bed from the H_2O produced from the top of the bed. This contribution clearly shows the impact of H_2O on the cobalt crystallites to hinder reduction and facilitate sintering of the cobalt particles. *In situ* X-ray diffraction was used to follow the reduction of the cobalt phase throughout the evolution of the reduction process, while controlled water production and cofeed was used

Download English Version:

<https://daneshyari.com/en/article/4755513>

Download Persian Version:

<https://daneshyari.com/article/4755513>

[Daneshyari.com](https://daneshyari.com)