

High Temperature GC Analysis of Fischer-Tropsch Reaction Products using the Agilent J&W FactorFour VF-5ht UltiMetal Column

Application Note

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Introduction

Alternative fuels that are not derived from petroleum, such as biodiesel, biomass to liquid (BTL) or gas to liquid (GTL) diesel, are increasingly being developed and adopted. Although the Fischer-Tropsch process is an established technology for the production of GTL or coal to liquid synthetic petroleum products, its popularity is hampered by high capital costs and the uncertain and volatile price of crude oil.

Fischer-Tropsch reaction products mainly consist of straight and branched alkanes. Long chain hydrocarbons up to C100 may be formed in this process. The GC analyses of these high boiling hydrocarbons products require oven temperatures up to 440 °C in order to elute the C90 – C100 HC fraction. The UltiMetal column, coated with the highly temperature stable and durable VF-5ms arylene stabilized liquid phase, is successfully applied for this HT-GC analysis.

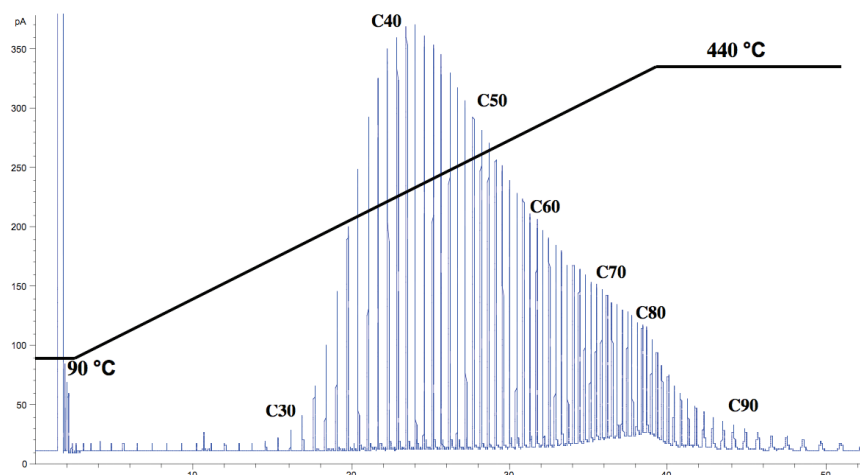


Figure 1. High temperature GC analysis of Fischer-Tropsch synthetic paraffins on VF-5ht UltiMetal column



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Results and Discussion

The VF-5ht UltiMetal column shows an excellent durability over many months and multiple analysis cycles as illustrated by the elution profile in figure 2. The retention times of the C35–C55 middle fraction have shortened somewhat compared to the original first analysis on a new column due to a minor loss of stationary phase. This illustrates the robustness of the column considering the longer term exposure of the column to an oven temperature of 440 °C. Even after 500 analyses cycles equaling a 125 hour exposure to 440 °C, the resolution and peak profiles are still excellent, indicating the high thermal stability of the VF-5ms liquid phase.

Obviously, regular fused silica tubing with its polyimide outercoating will not be able to withstand these high operating temperatures. For this reason, the VF-5ms liquid phase has been coated on UltiMetal-treated SS tubing, which provides a virtually unbreakable metal column material with excellent inertness properties similar to fused silica tubing. The Agilent UltiMetal tubing is manufactured using proprietary deactivation technologies.

Conditions

Column:	VF-5ht UltiMetal, 30 m x 0.32 mm x 0.10 µm (part number CP9096)
Sample volume:	1 µl
Carrier gas:	2.5 ml/min Hydrogen, constant flow
Injector:	Cool on-column
Temperature:	90 °C, 25 °C/min, 150 °C, 8 °C/min, 440 °C (15 min)
Detector:	FID, 440 °C

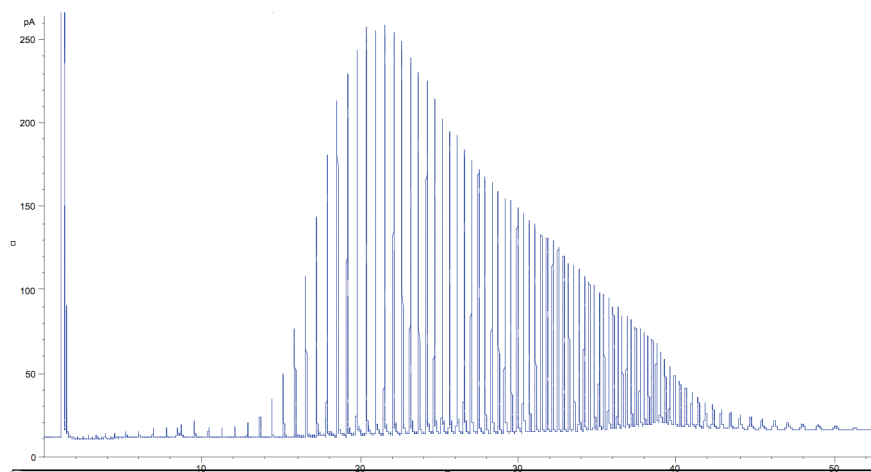


Figure 2. High temperature GC analysis of Fischer-Tropsch synthetic paraffins on VF-5ht UltiMetal column (500 analyses cycles)

Data - courtesy of Susanne Buchwaldt, Sasol Wax GmbH

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