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MDA Quantification in Jet Fuel

Abstract

ASTM D1655, Standard Specification for Aviation Turbine Fuels, defines a maximum allowable limit for Metal Deactivator Additive (MDA) in jet fuel. ASTM D8545 is currently the only ASTM-published method for quantifying MDA in jet fuel, and was developed in conjunction with Axcend's FocusAnalyze™. This portable system enables accurate, on-site determination of MDA concentrations in under 10 minutes, bypassing the delays of traditional lab-based testing. By providing immediate insight into MDA levels, FocusAnalyze supports compliance with fuel specifications, helps maintain thermal stability, and reduces the risk of metal-catalyzed degradation in aviation fuels.

Introduction

The FocusAnalyze is a liquid chromatography based portable analyzer able to provide real time determination of the presence and specific concentration of MDA in an aviation turbine fuel sample at installation level or in a field environment outside of a laboratory. MDA is added to aviation turbine fuel to inhibit thermal degradation caused by trace metals such as copper. The FocusAnalyze enables a technician to determine the presence and level of MDA in a fuel sample in under 10 minutes. The current process requires samples of suspected thermally unstable fuel or fuel previously doped with MDA to be collected on site and then shipped to a laboratory, which can take 2-10 days for results. During this transit and analysis time, fuel inventories and fuel servicing equipment are placed in a quality hold status, preventing the ability to support aircraft or ground vehicle generation and mission requirements.

ASTM Specification D1655, which defines requirements for aviation turbine fuels, includes a maximum allowable MDA concentration of 5.7 mg/L. The method used with the FocusAnalyze has been approved by ASTM as **Method D8545, the only published standard for the quantification of MDA in jet fuel.** The ability to quantify MDA concentrations on-site using a validated, standardized method provides a practical alternative to traditional laboratory testing and supports real-time fuel quality assessments in operational environments.

Methods and Materials

Column	15 cm x 300 µm i.d., 3 µm Inertsil Diol
Mobile Phase	A: heptane, B: 50% nBuAc in nC7
Gradient	0.50 to 99% B in 10 min nonlinear program
Flow Rate	6 µL/min after 3.5 min equilibration
Injection Volume	3 µL
Detection Wavelength	315 nm

Results

A sample of Jet A fuel was spiked with 5 ppm MDA and analyzed using the updated method. Figure 1 shows the chromatographic separation of MDA from the blank fuel background. The method provides clear resolution and robust peak area measurements, suitable for quantifying MDA across a range of concentrations.

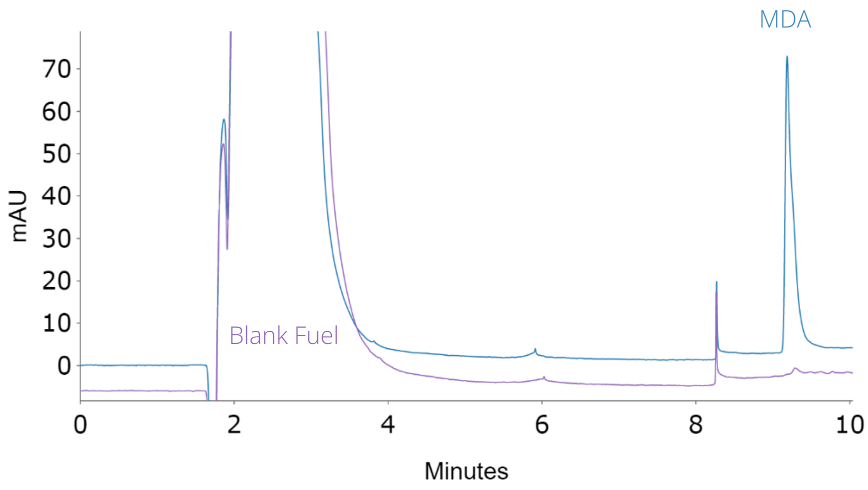

Figure 1. Chromatographic separation of Jet A fuel spiked with 5 ppm MDA compared to blank fuel.

A calibration curve generated from samples ranging from 0 to 10 ppm MDA produced excellent linearity, demonstrating suitability for routine analysis of fuel samples requiring compliance with ASTM D1655 MDA limits.

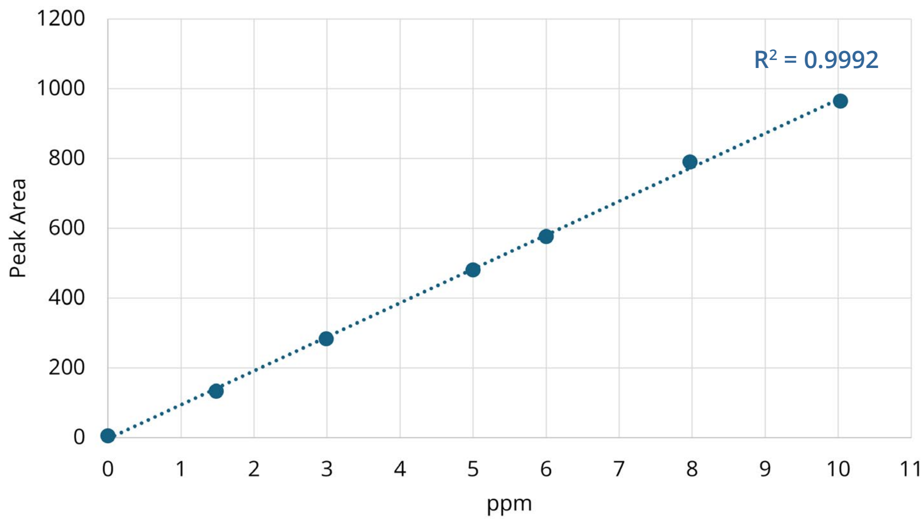

Figure 2. Linearity plot of MDA peak area vs concentration.