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HIGH-TEMPERATURE STABILIZERS FOR CHINESE RP-3 JET FUELS AT 700 K

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In the modern aircraft, jet fuel generally not only provides the propulsive energy for flight, but also plays a crucial role in the thermal management system as a primary coolant to absorb a large quantity of excess heat of fuel system and engine subsystems. Unfortunately, exposed to significant higher temperature than 150 °C, jet fuel inevitably degrades in presence of the dissolved oxygen (ca. 70 ppm) and leaves behind solid deposits on the wetted passages surfaces. In this paper, a series of electrically heated tube experiments is conducted to study the performance of several thermal-stable stabilizers of Chinese RP-3 jet fuel under similar conditions expected in the thermal management system of advanced engines. Solid depositions of the thermally stressed Chinese RP-3 jet fuels from 400 K to 700 K are tested in 321 SS tubes (2000×2.2×0.2 mm) at a mass flow rate of 120 g/min under 5 MPa. It is found that the deposition peak at 350 °C is completely eliminated, and that the total carbon deposition rates of Chinese RP-3 jet fuel saturated with oxygen is reduced above 60% with an optimal concentration of developed additive packages consisting of antioxidant, metal deactivator, detergent/dispersant, and oxygen scavenger. Therefore, the developed antifouling additive for Chinese RP-3 jet fuels is effective to prevent the deposit formation when the fuel is used as coolant.