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A LABORATORY ASSESSMENT OF THE COMPATIBILITY OF FISCHER-TROPSCH DERIVED (ISO PARAFINNIC KEROSENE) AND BLENDED FT-PETROLEUM-DERIVED FUELS WITH NON-METALLIC MATERIALS

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Since the synthesis of a liquid hydrocarbon fuel from coal by Franz Fischer and Hans Tropsch in 1923, there has been recurring interest in developing this fuel for military and commercial applications. The Fischer-Tropsch (FT) process can be used to produce high quality liquid transportation fuels from a wide variety of hydrocarbon feedstocks, such as coal, natural gas and biomass, and could reduce reliance on crude oil. FT fuels are unique in that they closely resemble conventional petroleum distillate fuels in their complexity, boiling range, and critical physical properties and they can conceivably be used interchangeably with petroleum derived fuels such as JP-8 and Jet-A. However, a major difference between FT and conventional fuels is that FT fuels are comprised solely of iso- and normal-paraffins and do not contain aromatics and heteroatoms. This is significant in that engine designs and materials have evolved over time to accommodate the idiosyncrasies of petroleum distillate fuels, most notably the interactions between the aromatic components in fuel and non-metallic materials and without these species there may be considerable difficulty in using FT fuels interchangeably with conventional fuels.

The present study began by developing a relatively fundamental understanding of how hydrocarbon fuels interact with non-metallic materials, then applying that knowledge to anticipate how alternative fuels such as neat FT and FT fuel blends will interact with these materials. This methodology is proving useful in understanding the fundamental material compatibility issues related to the use of alternative fuels and developing strategies for mitigating these issues. In this paper an overview of the significant results, test procedures, and analysis techniques will be presented.