

Chemical Aspects of Thermal Instability in Jet Fuels from Saudi Arabian Crude Oils

M. F. Ali, A. J. Hamdan and A. Nizami

Department of Chemistry

King Fahd University of Petroleum & Minerals

Dhahran 31261, Saudi Arabia

INTRODUCTION

Fuel stability or more correctly fuel instability is complex and the reactions that contribute to instability are not fully understood yet. It is generally recognized that the presence of reactive compounds (N, O & S) are a major cause of instability and ease of degradation which usually results in the formation of insoluble sediments. These sediments are deleterious to fuel quality and tend to foul fuel lines, filters, valves and injection nozzles. For decades several studies have been conducted in an effort to define the reactive compounds, the composition of the sediments produced and mechanisms involved. A free radical chain mechanism has been accepted as a fundamental mechanism, while recently electron transfer initiated oxidation (ETIO) has been suggested as a mechanism for autoxidation of pyrroles (1). Nitrogen containing aromatics have long been associated with storage instability in a variety of fuels (2, 3), yet present knowledge regarding the chemistry of their autoxidation is very limited particularly in complex fuel media. One approach to studying this problem involves the examination of model nitrogen compounds as dopant in stable base fuel. Fuel dopants studies are useful in screening nitrogen compound classes for potential activity. This paper discusses the effects of light, storage conditions and the doping of model nitrogen compounds alone and in combination with oxygen compounds on sediment formation in jet fuels from Saudi refineries. The elemental analyzer, infra-red spectroscopy and mass spectrometry were employed for the analysis of 2,5-dimethylpyrrole promoted sediment.