Infrared spectrum study of Mtech activated ULP and Diesel fuel

Place of Testing

University of Western Australia

Instrumentation

Perkin Elmer Spectrum One FTIR spectrometer.

Materials

Commercial grade unleaded petrol M1058 and diesel M1041

Mtech Fuel Saver for petrol vehicles

Mtech Fuel Saver for diesel vehicles

Experimental Procedure

Commercial grade ULP and diesel fuel was obtained before the test. 750ml of each fuel was separated into glass jars and activated by inserting the Mtech Fuel Saver into each jar (see appendix 1). The activation process took 20 minutes.

Two FTIR spectrums were obtained from the untreated ULP and diesel fuel using the Perkin Elmer Spectrum One with the following operative parameters: Scanning resolution 4 cm^{-1}, scanning range 400- 4000 cm^{-1}. Both the absorption and transmittance were measured. The region below 470 cm^{-1} did not yield clear results, so conclusions are omitted from this region.

Two FTIR spectrums were obtained from the treated ULP and diesel fuel. The spectrum of the treated ULP and diesel fuels was subtracted from the spectrum of the untreated samples after normalisation of the data.

Results

During activation, a visible change was produced in the ULP. Immediately after insertion, the colour of the petrol darkened by a number of shades.

The difference in absorption ability of ULP after treatment with the Mtech Fuel Saver is clear in three regions of the infrared spectrum (appendix 2). The region with the most difference, from 2900 to 3100 cm^{-1} represents the saturated and unsaturated C-H bonds. This region shows a difference in absorption from 5 to 55 units. The treated ULP is absorbing less infrared radiation.

The difference in the absorption ability of diesel fuel after treatment with the Mtech Fuel Saver is slightly less pronounced, but still apparent. The region with the most difference is from 3200- 3500 cm^{-1}). The treated diesel is absorbing less infrared radiation.

Discussion

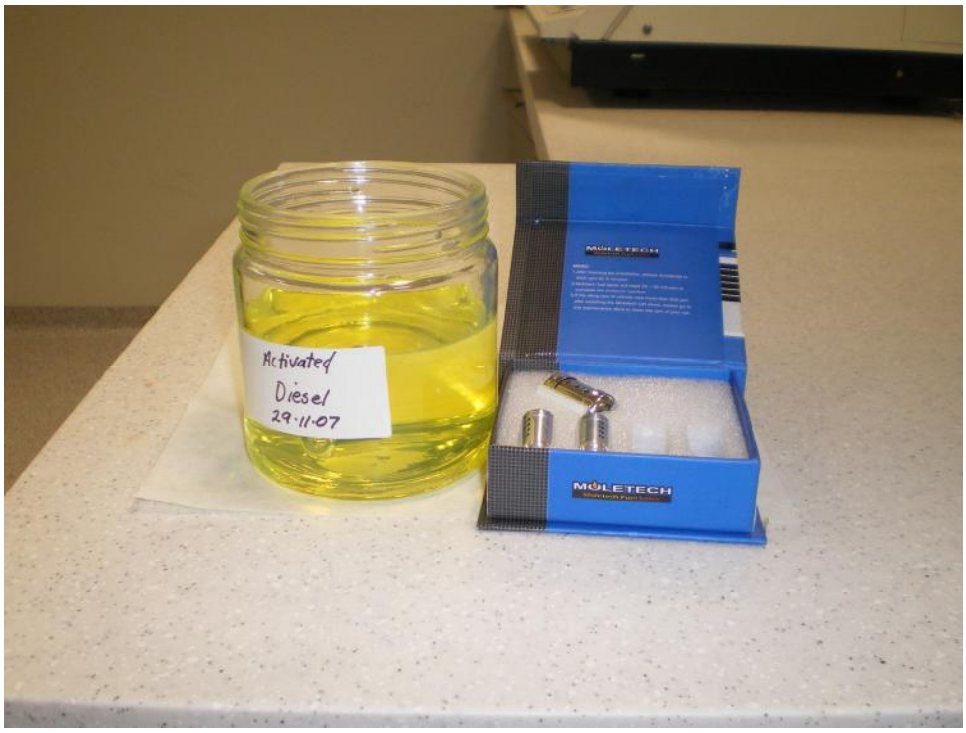
From the results of the spectrum analysis it is clear that the Mtech Fuel Saver changes the propertied of ULP and Diesel.

It is suggested in a study by Chien-Chung, referencing Wei et al, that this difference in absorption by both the treated ULP and treated diesel is due to the ceramic powder of the Mtech absorbing the thermal energy from the ULP or diesel and releasing it in specific wavelength from 5 -55 units (from 2900 to 3100 cm^{-1}) in ULP and from 2 – 7 units (3200-3500 cm^{-1}). This specific energy is in concert with the van der Walls forces between the ULP and diesel molecules. Hence the intermolecular van der walls forces are broken, which results in the change of petrol molecules from clustered to unclustered.

It is suggested by Chien-Chung, that the change in aggregation of petrol molecules chances several properties of the samples such as surface tension and flash point. The surface tension of the treated ULP and diesel fuels is decreased and when a vehicle is in motion, leads to smaller droplets of petrol in the combustion cylinder. These smaller droplets have in turn a larger total surface area to react with oxygen during combustion and therefore are burnet more completely in a cleaner combustion reaction. A cleaner combustion leads to higher fuel efficiency and a reduction in emissions (Twigg, 2007).

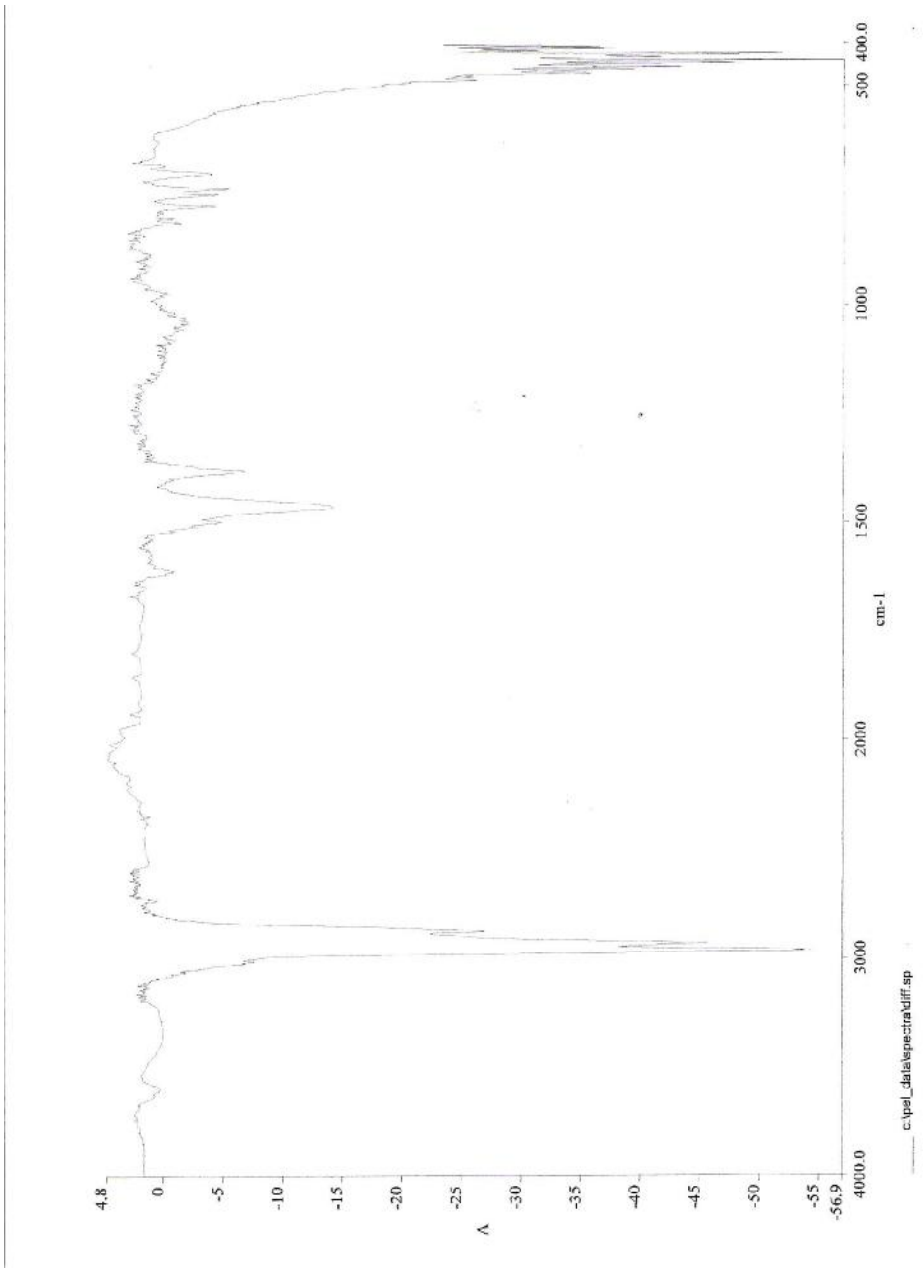
Appendix 1

Activation of the ULP and diesel fuel with the Mtech Fuel Saver.



Appendix 2

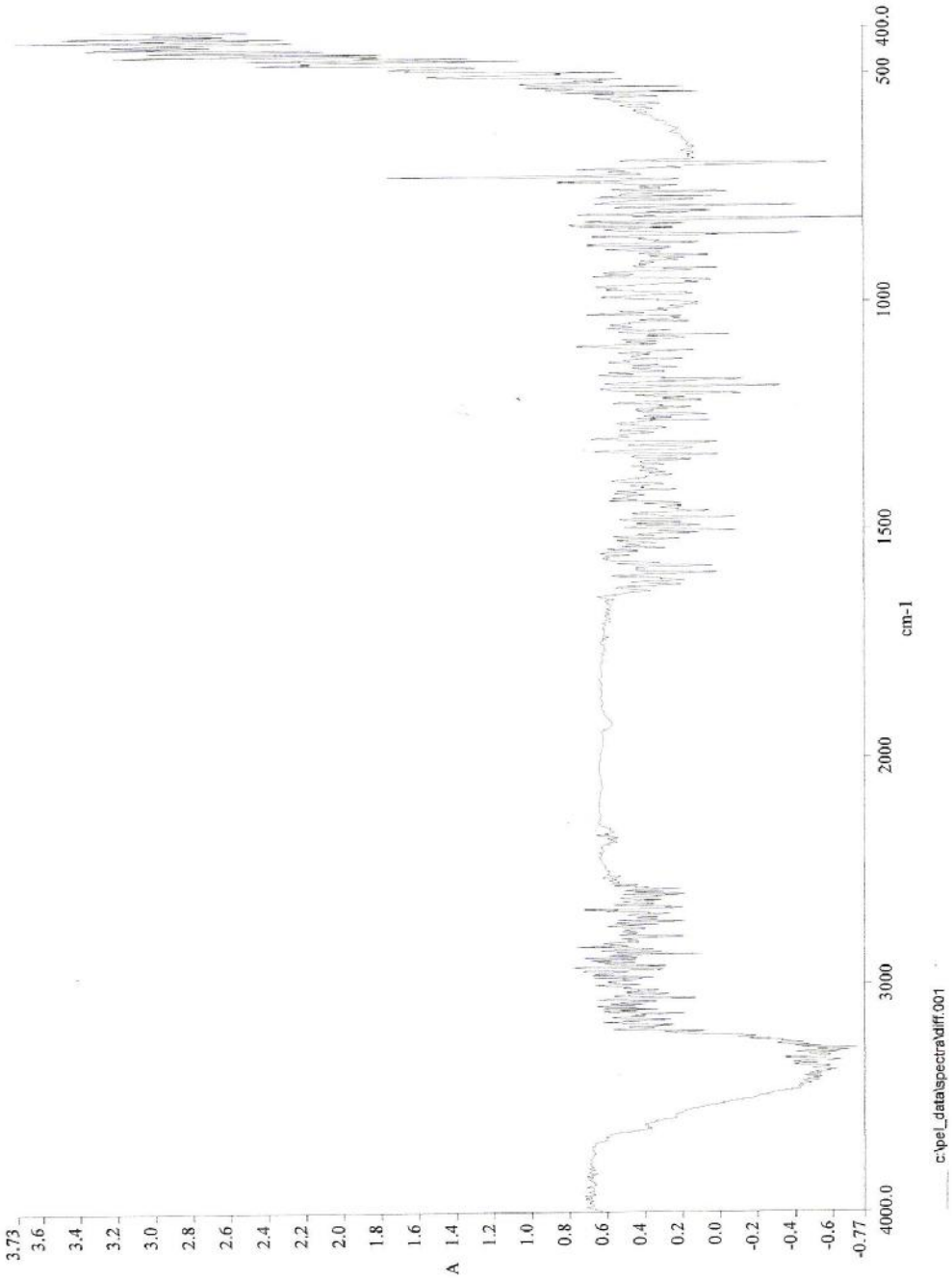
The spectrum difference in ULP after activation with Mtech Fuel Saver.



Note the three regions of change of absorption.

Appendix 3

Spectrum difference in diesel after treatment with the Mtech Fuel Saver



Chien-Chung (no date) Infrared spectrum study of Moletech activated gasoline. Taipei Medical University, Graduate Institute of Biomedical Materials and Engineering.

Twigg, Martyn V. Progress and Future Challenges in Controlling Automotive Exhaust Gas Emissions. *Applied Catalysis B: Environmental* 70, no. 1-4 (2007): 2-15.