ABSTRACT

The finite nature of fossil fuels necessitates consideration of alternative fuels from renewable sources. Biodiesel from vegetable oil is overwhelmingly accepted world over, because the starting material is available widely, ease of handling and importantly it is environmentally benign. Biodiesel burns similar to petroleum diesel as it concerns regulated pollutants. In this work biodiesel was synthesized from castor oil following the transesterification route using methanol. The methyl ester thus synthesized was successfully characterized by FTIR, ^{1}HNMR and ^{13}CNMR spectroscopic techniques, further their various physical properties were determined such as acid value, hydroxyl value, saponification value, iodine value etc. The biodiesel was blended with petroleum diesel at three different weight percentage and their properties were studied. Cetane number, viscosity, density, and higher heating value are important properties to affect the utilization of biodiesel fuels, because they are involved in the definition of fuel quality and are required as input data for predictive engine combustion models. For the blend with 5 wt% of biodiesel cetane number, density, flash point, ash content, sulfur content were found to be within the limits of the standard specification. The viscosity as measured by Brookfield viscometer was observed to increase with the increase in the biodiesel content and 1 wt% blend exhibiting the lowest viscosity. One of the major drawbacks of biodiesel is that they are prone to oxidation under operating conditions. The oxidation stability of the pristine biodiesel and antioxidant (a natural extract and polyaniline naofibers) incorporated biodiesel was studied by a Rancimat apparatus. The oxidation stability showed an enhancement of about 177% for polyaniline and 348% for the natural extract incorporated biodiesel respectively. Thus the natural extract exhibited high potential to be used as an antioxidant in commercial biodiesel. Thus the present work is a systematic study which highlights the various aspects of biodiesel and its blend particularly its commercial utility was focused.