

Novel imine compound as potential antioxidant additives for biodiesel

Vivian C. da Silveira^{1*}, Kelly C.C.S. Ramos¹, Matheus M. V. da Silva¹, Lucas F. Martins¹

¹Universidade Federal do Espírito Santo, São Mateus, Brazil

*e-mail: vivian.silveira@ufes.br

Biodiesel, one of the most promising renewable energy sources, is susceptible to oxidative degradation when exposed to metal contaminants, light, or air.¹ In this context, a novel compound has been prepared and characterized (RMN, IR, elemental analysis) with the aim of prevent the oxidation of biodiesel as chelator of transition metals that are responsible to catalyze degradation process.

The compound was synthesized according Singh *et al.* 2008,² by reacting palmitic acid and 2,4-dihydroxibenzaldehyde to produce an ester. This ester was reacted with ethylenediamine (2:1) in chloroform, producing a new imine compound (DHBEN palmitic –Figure 1).

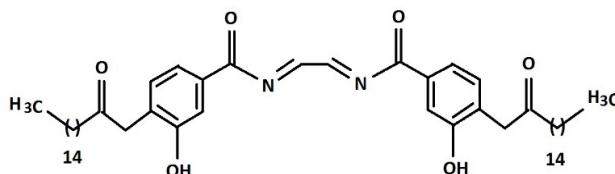


Figure 1: Imine dhben palmitic structure.

The estimated stability constants (K^{AD}) and the molar extinction coefficient (ϵ^{AD}) was determined by UV using the Benesi-Hildebrand equation. The values of K^{AD} constants to DHBEN-Ni and DHBEN-Cu are respectively 0.144 and 0.271 (L mol⁻¹) $\times 10^{-3}$, indicating that DHBEN-Cu complex is more stable.

It was evaluated the peroxide values in triplicate, according ASTM D3703, of biodiesel samples with and without imine compound (60 ppm) and with or without metals contaminants (copper and nickel at 40, 60 and 80 ppm). All mixtures were stored in glass containers at room temperature for the testing period of 30 days. Table 1 shows the peroxide values obtained after 30 days storage time contaminated with 60 ppm of Cu or Ni ions.

Table 1. Peroxide values of samples after 30 days storage time.

Samples	Peroxide Value (meq/kg)	Samples	Peroxide Value (meq/kg)
Pure biodiesel (initial)	9.47 \pm 0.65	Biodiesel + Ni	206.20 \pm 1.55
Biodiesel + DHBEN + Ni	56.72 \pm 1.30	Biodiesel + Cu	1387.45 \pm 3.30
Biodiesel + DHBEN + Cu	352.20 \pm 2.54	Pure biodiesel (30 th day)	179.70 \pm 1.30
Biodiesel + DHBEN	28.64 \pm 0.70		

It was shown that the biodiesel in presence of copper ions was more susceptible to oxidative degradation than the others samples. The presence of DHBEN can retard the biodiesel degradation being more effective for nickel. An index above 300 meq/kg is extremely high for biofuels, so the imine is not efficient enough for copper. The compound DHBEN was capable to decrease oxidative degradation even in pure biodiesel, showing that can act like scavenging free radicals. Therefore, the compound can be potential candidates for antioxidant additives for biodiesel.

1. Frauches-Santos, C.; Albuquerque, M. A.; Oliveira, M. C. C.; Echevarria, A.; *Rev. Virtual Quim.* **2014**, 6, 293.
2. Singh, A. K.; Kumari, S.; Kumar, K. R.; Sridhar, B.; Rao, T. R.; *Polyhedron* **2008**, 27, 181.