Ewa Sabura

„Study of high performance additives for motor gasolines using thermal analysis ”

Summary

Nowadays, the high performance additives are commonly added to all commercial gasolines to improve required gasoline properties and to protect the engine and the environment. The deposit control additives (DCAs) asume the highest importance. Their share in the whole additive market is about 40-50%. Their role is to clean up and keep clean the fuel supply system and the combustion chamber, through removing deposits and preventing their formation. Deposits in engine influence emission, fuel economy, driveability and performance.

Among the gasoline additives, the latest generation of deposit control additives are Mannich base. These additives are typically prepared by starting with a polymer, commonly applied is polyisobutylene (PIB), and then grafting on a polar function, such as an amine, by means of a polar linking group In the current study different structures of Mannich bases were synthesized, by reaction of alkylphenols with diamines and formaldehyde. Ternary additive packages were prepared: detergent substance (Mannich base), carrier oil (propoxylated dodecylphenol) and diluent.

The produced Mannich compounds and additive packages were characterized by using thermoanalytical method, basically thermogravimetry. These techniques are effective to determination of thermal and thermooxidative stability of materials, therefore they can assist in characterizing fuel additives with respect to their propensity to volatilize/decompose. The relative thermal stability of different Mannich bases was correlated to the chemical structure and the presence of amine groups. The results were related to the combustion behavior at high temperatures (engine work conditions). The above research was done in order to show structure/performance relationships of the additives, with reference to their thermal degradation patterns and the combustion mechanism. For these reasons, thermal analysis can be applied as a screnning test of the newly designed deposit control additives before the required “CEC” engin tests have been performed.