Green industrial lubricant developed

July 10 2009

This is lubricating grease based on ricin oil and cellulose derivatives. Credit: Franco et al.

A team of researchers from the University of Huelva has developed an environmentally-friendly lubricating grease based on ricin oil and cellulose derivatives, according to the journal *Green Chemistry*. The new formula does not include any of the contaminating components used to manufacture traditional industrial lubricants.

"The objective of this research was to develop a product that could be used as a lubricating grease but that was made only from natural materials and was therefore 100% biodegradable", José María Franco, a chemical engineer at the University of Huelva and co-author of the study published recently in Green Chemistry, tells SINC.

Environmentally-friendly greases are "oleogels" that use cellulose derivatives from plants and ricin oil (from a bush in the Euphorbiaceae family) as a lubricant base. Franco says these new formulations are "an alternative to traditional lubricating greases, which create pollution that is difficult to combat once discharged into the environment".

Lubricants used in industry are made from non-biodegradable components, such as synthetic oils or petroleum derivatives, and thickeners made with metallic soaps or polyurea derivatives (a family of synthetic polymers). These are currently the best performers, but they also imply more problems from an environmental perspective.

Millions of tonnes of hydraulic and industrial oils, and others from machinery, are discharged each year into rivers, the sea and fields. Mineral-based oils can contaminate groundwater for more than 100 years, and can prevent the growth of trees and prove toxic to aquatic life.

Only partial solutions have been found to date for this problem, such as substituting mineral oil for vegetable ones, but no alternatives had been found to the metallic thickeners, which are also highly polluting. The new green grease provides an answer, although the scientists admit that "more research is needed" in order to perfect its lubricating and anti-wear performance.

Franco tells SINC that the new material "has a similar level of mechanical stability to that of traditional greases, and it is highly temperature resistant, with rheological properties (viscosity) that do not change greatly, although we have observed that the material is expelled in large quantities when subjected to large inertial forces at high temperatures". When this substance is used in bearings, it is important that it is not easily shed. This will reduce the lubrication frequency, thus maintaining the ideal functioning conditions for machinery for a longer time.

The researchers will continue to investigate this aspect in order to find a way of balancing the use of biodegradable ingredients to manufacture the grease while also optimising its lubricating capacity.

In any case, the scientists have proved that "oleogels" based on cellulose derivatives are not only environmentally friendly, but are also advantageous in that they are easier to process, and that manufacturing them requires simpler technology than that used to make conventional greases.

More information: R. Sánchez, J. M. Franco, M. A. Delgado, C. Valencia y C. Gallegos. "Development of new green lubricating grease formulations based on cellulosic derivatives and castor oil". *Green Chemistry* 11: 686-693, 2009.

Source: FECYT - Spanish Foundation for Science and Technology