A laser technique proves effective to recover material designed to protect industrial products

19 March 2019

Credit: CC0 Public Domain

Fluoropolymers are macromolecules made up of carbon and fluoride which, due to their properties, tend to be used as non-stick and anticorrosive coatings on a wide range of material. Products in the clothing, graphic, chemical and car industries as well as different metal molds and kitchen utensils need fluoropolymers for their coatings and to improve their features regarding sticking and resisting corrosion.

These kinds of coatings tend to be quite effective due to their characteristics. They resist abrasion, they behave stably at high temperatures and their structure is not affected by most chemical agents. Nevertheless, despite their resistance, they wear away with use like any other kind of material. In order to deal with this issue, the alternative to replacing the whole piece, often times a very expensive solution, is removing the coating, taking out any impurities and taking off any parts that are attached, and recoating it.

Here is where the merits of fluoropolymers become a problem. Since they are extremely resistant and chemically inert materials, they adhere to a surface and do not come off easily. To deal with this, the Manufacturing Processes Engineering research group at the University of Cordoba has validated a new method to take off these kinds of coatings using a laser technique.

After doing several tests on the material, the research group characterized different parameters such as toughness, roughness and mechanical properties of the material after being exposed to the laser. The IK4-Tekniker Foundation also participated in this testing.

As researcher Guillermo Guerrero Vaca, one of the authors of the paper, explained to us, the results show that the technique works effectively, especially for one kind of fluoropolymer, PTFE, so "we can conclude that it could be an alternative for these kinds of coatings instead of other kinds of methods."

He is referring to the Nd:YAG industrial laser, which is a continuous wave and solid-state laser that possesses yttrium oxide and aluminum doped with neodymium. Though it has several applications, for instance in the field of welding as well as in ophthamological treatments, never before has it been used for these specific kinds of materials.

Despite one of its drawbacks being the costly equipment, as Professor Guerrero Vaca points out, its price has decreased over the last few years. The next step to improve its usefulness would be to make the process automatic, something that could be made possible in the future using robotics.

More information: Óscar Rodríguez-Alabanda et al, Study on the Main Influencing Factors in the

Removal Process of Non-Stick Fluoropolymer Coatings Using Nd:YAG Laser, *Polymers* (2019). DOI: 10.3390/polym11010123