Innovative Coating Solutions

SPECIAL COATINGS FOR POLYMERS

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1. Overview

Our coating technology utilizes nanoscale effects to chemically attach a ceramic or other layer to a polymer substrate, thus achieving the desired optical and tribological capabilities such as anti-scratch capabilities.

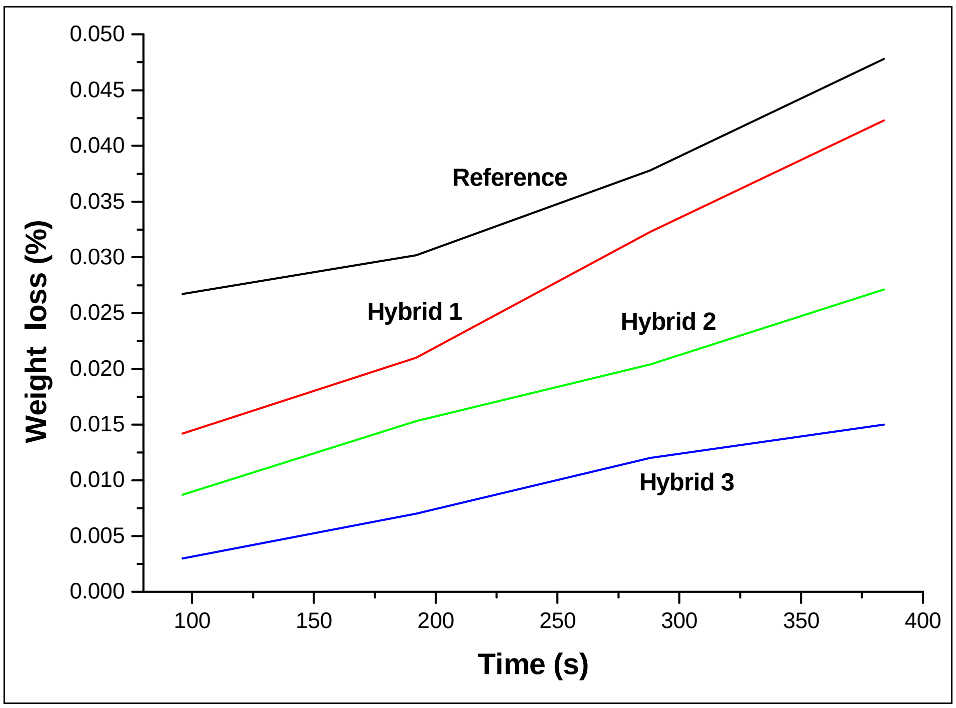
2. Benefits

Our coating technology has the following benefits:

- Less porosity than coatings prepared by sol-gel methods. The porosity in a sol-gel film is dependent on the interstitial spaces left by the sol particles. However, in our process there is no sol formation, thus the porosity is exclusively controlled by the chemical kinetics of the process itself. Reduced porosity results in higher wear resistance.
- Stronger adhesion of the coating to the substrate since there is a chemical bond instead of the physical interaction resulting from many other processes.
- Favorable temperature and pressure conditions during manufacturing versus other methods such as chemical vapor deposition, sputtering, thermal oxidation, plasma-enhanced chemical vapor deposition, or flame hydrolysis. Our process is largely carried out at room conditions using simple, economical equipment.
- Flexibility to use a variety of application methods thus making it easier to integrate the coating into existing manufacturing processes.
- Environmentally friendly since the water used in the process can be easily treated, the raw materials have low vapor pressures thus minimizing evaporation losses, and the VOC values are very low.
- Economical raw materials.

3. Selected Experimental Results

The following chart shows the results of an abrasion test where a rotary disc with 400 grade sandpaper is spun at 1,000 rpm, on which the samples were abraded. The horizontal axis shows time and the percentage of material eroded is shown on the vertical axis. The line labeled "Reference" is uncoated PMMA while the ones labeled "Hybrid X" are the coated results where the "X" represents the number of coating layers. In general, performance was improved with additional layers, but after 5, the improvements were minor.



The following pictures show Atomic Force Microscopy (AFM) images of coated and uncoated PMMA. Figure 1 shows the very smooth surface of the original polymer while Figure 2 shows the coating that has been grown on top. Note that the roughness is at a nanometer scale and that the images are of the top layers only, not the entire cross section of the sample. These images demonstrate that our coating grows on the surface via chemical bonding.

Figure 1 – Atomic Force Microscopy image of uncoated PMMA plate

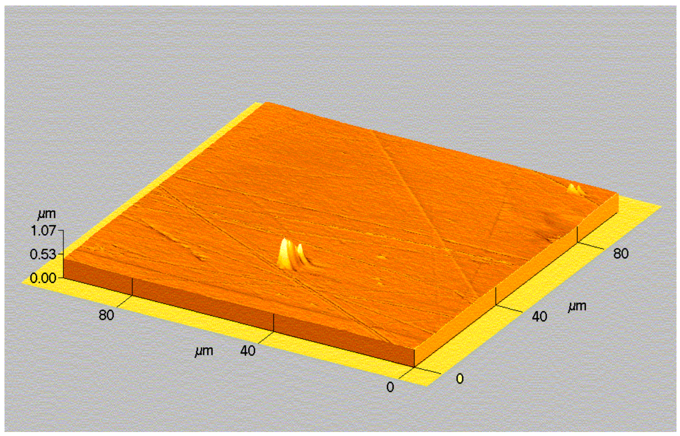


Figure 2 – Atomic Force Microscopy image of coated PMMA plate