DRYTREAT

Future Materials™
Technology for Competitive Advantage

Building Barriers

Limestone and marble are becoming increasingly popular in both interior and exterior building applications. As porous calcium-based materials, however, they suffer poor resistance to common household acids such as lemon juice, orange juice and vinegar. Acid etching of these materials occurs quite readily, so just a few drops of juice spilt from a glass and left unnoticed may, within minutes, leave a permanent mark on the surface.

Developing a product to counteract this unfortunate behaviour has proved a technical challenge to Dry-Treat, a small Australian company based in Sydney. Dry-Treat manufacture a range of chemical sealers that penetrate deeply and provide a strong, invisible and breathable barrier to protect natural stone, tiles, pavers, concrete and grout against damage caused by water, water-borne salts, graffiti and oil based stains.

According to company director Stuart Anderson, the next 'holy grail' would be a coating for calcium-based materials such as marble and limestone that is acid resistant for 24 hours, clear, cures at room temperature and can be applied as a final treatment. The standard coatings currently available are not effective: a pinhole leads to failure and protective films are usually required.

Enter Professor Robert Lamb and colleagues at the Surface Science and Technology group in the School of Chemistry at the University of NSW. They have conducted extensive research on substances known as super-hydrophobic coatings (SHC). Coatings prepared to date have characteristics that include: the ability to be fabricated at room temperature, resistance to high temperatures, inert and environmentally safe, permeable to gas, will reduce drag, are self-cleaning, and have the potential to make surfaces non-adhesive towards ice, snow, biological foulants and other unwanted contaminants.

The obvious next step was to test the effectiveness of the SHC on calcium based materials. Now barriers are not usually applauded but in this case it was a barrier both parties were very happy to build. Dry-Treat wanted to pursue novel materials and formulations, but did not have the resources; while Rob Lamb and his team had the surface chemistry skills and expertise, and were keen to find new industrial applications for their coatings. Since commencing work together in June 2005, the collaboration between Dry-Treat and the Surface Science and Technology Group has continued to flourish and some very encouraging results have been obtained. The work continues, but it does seem that the holy grail does exist.

The School of Chemistry at the University of NSW hosts the NSW State Office of Future Materials (and was one of the six founding members of Future Materials).

Have you ever wondered how hydrophobic coatings were discovered? As with most things it started with the observation of nature. A scientist observed that when water hit the leaf of a lotus plant, the water rolled off effortlessly. Now the goal is to achieve this kind of performance on other materials.

The coatings developed by Dry-Treat rely on chemical changes to achieve the water repellant features. The main component is a molecule which consists of silicon, carbon, hydrogen and oxygen atoms. There is a part that repels water and another part that attracts water. When the sealer is sprayed onto the building material it reacts with the moisture. The water friendly molecules break off and form ethanol while a new compound called silanol is left to react with the surface layers of the masonry to form a very strong, water repellant bond.

The coatings developed by the team at UNSW rely on engineering a "nanoscaled roughness" into the components to mimic the roughness of the lotus leaf and duck feather.

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