Management

Worth watching

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Detecting forgeries

The ancient art of forgery might soon be consigned permanently to the history books following the development of a new technology in Rome that can detect forged handwriting using 3D holograms.

Until now, spotting forged signatures or handwriting has remained the preserve of experts who analyse the sequence of individual strokes in a piece of handwriting using two dimensional samples.

But because it can be difficult to determine the exact sequence of strokes using this method, a well executed forgery can still go undetected.

As it is almost impossible for a forger to reproduce the exact variation of pressure used by the original writer, a 3D analysis can yield a more effective means of detection.

The 3D Micro-profilometry technique developed by the University of Studies, Rome Three, works by creating a 3D hologram of the path of a piece of writing, which generates an image on a computer that looks like a ditch or furrow.

The technology uses a combination of image processing and virtual reality to create the hologram and by analysing the variations or bumps generated by the pressure applied to the paper at crossover points, like that at the centre of the number 8, forged writing is far easier to spot.

The team in Rome team used the technique to analyse hundreds of different handwriting samples made using a variety of different paper types and pens, with findings reported in the Institute of Physics journal, Journal of Optics A.

They also report that they have successfully applied the new technique to wills and cheques.

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A safer way of combatting corrosion

Erin Brockovich's legal campaign to unearth the hidden threat of chromium, the anti-corrosive constituent of many paints and coatings, has spawned demand for safer industrial alternatives.

Chromates have been used commercially for almost half a century to protect metal from corrosion. But the Hollywood film starring Julia Roberts helped to reveal the more insidious carcinogenic properties associated with it.

To fill this gap, the University of Rhode Island has developed a new group of non-toxic, corrosion-resistant polymers that can emulate the most important functions of chromates.

More than just a barrier coating, which is ineffective against scratches, chromates and the new URI polymers inhibit the process of corrosion with “self-healing” properties. By forming a protective layer, the polymer is able to resist scratching, pinholes, pitting or stress cracking corrosion.

Most polymers act merely as insulators. However, the new product is made up of two separate strands, giving it additional conducting capabilities. The two strands allow electrons to move along the polymer chain and this give and take of electrons emulates the role of chromates by interrupting the electro-chemical process of corrosion.

The polymer also has a second strand that provides space for a variety of modifications to its physical structure, making it more amenable to processes such as spraying, dipping or spin coating.

It is hoped that the polymers will be effective as a low-cost, minor additive to paint, commercial paint solvents and water-based epoxies. The substance is also is designed to treat surfaces, steel coil coating, and as a corrosion resistant primer under other resin-coating systems.

Potential markets include coating of aluminium alloys for aircraft, aluminium and steel for the automotive industry, and concrete-reinforcing bars for bridges, highways and buildings.

The new polymers are also effective in prevention of the build-up of electrostatic charges, giving them a role in surgical wards and computer chip "clean rooms" where static can interfere with operations and production.

** The developers have been issued two patents and have four others pending on various versions of the new conducting polymers and are now seeking commercial collaborators.*

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Self-assembly on a small scale

Nanoparticles represent the microscopic building blocks of tomorrow's manufacturing materials and devices, but in order to put them to use, scientists must find a way of assembling them.

Programming the particles for self-assembly is the obvious solution and researchers at the University of Michigan have now created a computer model that shows how particular nanoparticles could be modified to do just that.

By applying sticky patches to particles, the researchers believe this may imbue them the ability to self assemble into a variety of complex shapes based on the molecules contained in their coating - in much the same way that viruses replicate.

Because the possibilities are infinite when it comes to researching all the different properties of nanoparticles, computer simulations are useful as a means of designing building blocks that chemists can attempt to apply in the lab.

The model developed by the University of Michigan applies a number of computer simulations where so called “patchy” particles self-assemble into various shapes such as staircases, chains, rings and pyramids.

Such structures are believed to have very useful applications in device manufacturing.

In a separate but related development, the US Department of Energy's Lawrence Berkeley National Laboratory and the University of California at Berkeley have announced a significant breakthrough in the development of the semiconductor nanowire, gallium nitride.

Single-crystalline gallium nitride nanowires and nanotubes have already shown promise for use in optical technologies such as light-emitting diodes and ultraviolet nanolasers. However controlling growth is critical to expanding their electrical and thermal conductivity.

For the first time, the researchers said they were able control the direction in which a gallium nitride nanowire grows using a familiar chemical vapor deposition technique.

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