



## Clever new adhesive will bond and debond on demand, for clearer and easier recycling.

Switchable adhesives, which can be turned on and off with various mechanisms such as heat have been around for some time. In July 2017 in ITS News, issue 19, we reported on a medical application adhesive produced by Itac for Lumina Adhesives, which can be switched off by UV light.

Now a team at the Karlsruhe Institute of Technology (KIT) in Germany, has developed a removable and reversible adhesive that makes it possible to easily and clearly take high-tech products such as mobile phones apart into their separate raw materials.

Recycling electrical scrap back into its raw materials saves resources. The European Union is currently promoting a recycling economy that preserves products, materials and resources for as long as possible. The UK is expected to follow the same guidelines even after Brexit. The service life of many electrical appliances is decreasing. A smartphone

is now likely to be phased out after one to two years. However, recycling it professionally and without residues remains a major challenge.

In commercial joining applications, adhesive bonding is increasingly replacing welding, riveting or screwing. Adhesives are not only simpler and more cost effective to apply, they also reduce the total weight and fulfil additional functions such as insulation or dampening. In the past the disadvantage was that once they had cured, the connections could only be loosened again with a great deal of time or energy. If a bonded product was dismantled for repair or recycling, it would often result in the damage or destruction of individual components.

The new thermolabile adhesive developed at KIT can solve this problem. Stable at room temperature, it can be degraded precisely, quickly and at comparatively low temperatures. Once the process is finished, this

is immediately apparent because the corresponding spot is coloured. For this “debonding on demand” (DoD), the formulators have built predetermined breaking points into the network of long-chain polymer molecules that make up a typical adhesive. At these points, even at moderate temperatures below 100 degrees Celsius, the chemical compounds open again and the adhesive dissolves. Its composition and the exact temperature required for the release can be adapted as required.

The smart adhesive was originally developed for dental technology to help gently remove bonded crowns or clasps. It could be utilised in a wide range of applications. In addition to electronics, many production applications are conceivable, for example to temporarily fix materials on a workbench or on construction sites, or to remove industrial dowels. The adhesive will now be further developed for commercial use.