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Spotlights on Recent *JACS* Publications

INCREDIBLE SHRINKING NANOPARTICULATE DRUG DELIVERY VEHICLE

Recent research has suggested that the treatment of many diseases, particularly cancer, could benefit from using nanoparticles as drug delivery vehicles. Daniel Kohane and coworkers have developed "photoswitchable" nanoparticles that shrink dramatically when exposed to UV light, releasing a bolus of the drug they carry all at once (DOI: 10.1021/ja211888a).

Other groups prepared earlier versions of such tiny pharmaceutical carriers, which had improved drug solubility, reduced clearance, lowered drug resistance, and enhanced therapeutic effectiveness compared with traditional treatments. Unfortunately, nanomedicines currently approved by the FDA for cancer provide only a modest survival benefit for patients, most likely because of poor tumor penetration. One drawback is their size, which is not always small enough to make it past connective tissue to enter tumors. Another common drawback is an inability to selectively trigger the release of these vehicles' cargo.

The researchers led by Kohane synthesized the photoswitchable nanoparticles from a material that undergoes a reversible rearrangement when stimulated with light. Upon UV irradiation, these nanoparticles shrink to about one-third of their original size. The carriers can hold a variety of different drugs, and they were shown to successfully infiltrate the cornea, a tissue notoriously hard to treat with drugs due to its dense collagen network. The researchers suggest that control over carrier size and drug release could make these nanovehicles a boon for treating many diseases. **Christen Brownlee**

CROSS-LINKED POLYMERS WELDED OVER BROAD TEMPERATURE RANGE

Because of their outstanding thermal and mechanical properties, chemically cross-linked polymers, known as thermosets, are used in structurally demanding applications by the aircraft and automotive industries. For the first time, researchers have shown that thermosets can be welded together over a broad temperature range with the help of transesterification catalysts.

The ability of a material to be welded is important for constructing complex objects, but thermosets have proven to be difficult to weld and reprocess once they are permanently cured. This property is different than for thermoplastics, which can melt and solidify along a temperature gradient.

A team of researchers led by Ludwik Leibler demonstrate for the first time that two pieces of vitrimer, a new class of cross-linked polymers, can be welded together with the help of zinc catalysts (DOI: 10.1021/ja302894k). For an epoxy thermoset with zinc catalyst, the group found that the welding process can be performed over a broad temperature range, in contrast to thermoplastics. They also explored the relationship between starting material concentration, catalyst composition, welding kinetics, and final strength of the material. The ability to vary the catalyst concentration offers control and flexibility unlike what is attainable for thermoplastic welding, the researchers say. **Christine Herman, Ph.D.**

ENZYME EXPANDS PROTEIN DRUG REMODELING

Protein drugs that help fight diseases from cancer to diabetes are frequently glycoproteins, meaning they have sugars attached to the protein chain. The therapeutic effect of a glycoprotein changes depending on the collection of attached sugars. Reliably isolating an exact version of a glycoprotein is difficult, and researchers use a wide range of chemical and cell-based methods to produce uniform glycoproteins. Now, Benjamin G. Davis and colleagues have expanded the utility of enzymatic glycoprotein remodeling with a new endoglycosidase, an enzyme that cuts sugars off of glycopeptides (DOI: 10.1021/ja301334b).

The researchers found an endoglycosidase, EndoS, that normally protects the pathogen *Streptococcus pyogenes* from human antibodies by trimimg complex carbohydrates off of mammalian glycoproteins, such as the human antibody immunoglobin G. The specificity of EndoS makes it different from and complementary to other endoglycosidases that are currently used to remodel glycoproteins in the laboratory. Additionally, EndoS shows the ability to remodel glycoproteins by also attaching specific chemically synthesized carbohydrates to the trimmed glycoprotein, which extends strategies that rely solely on cleaving variable sugar groups to obtain uniform glycoproteins.

The activity of EndoS broadens enzymatic glycoprotein remodeling strategies and provides greater selectivity to craft protein drugs, such as monoclonal antibodies, for therapeutic purposes. **Kenneth J. Moore**

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