Toys made of liquid wood

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Nativity figurines made of liquid wood. © TECNARO GmbH

(PhysOrg.com) -- Most plastics are based on petroleum. A bio-plastic that consists of one hundred percent renewable raw materials helps to conserve this resource. Researchers have now optimized the plastic in such a way that it is even suitable for products such as Nativity figurines.

Toys have to put up with a lot of rough treatment: They are sucked by small children, bitten with milk teeth, dragged along behind bobby cars, and every now and then they have to survive a rainy night outdoors. Whatever happens, it is vital that the material does not release any softeners or heavy metals that could endanger children.

Toys can be made of liquid wood in future. The advantage is that this bio-plastic, known as ARBOFORM®, is made of one hundred percent renewable raw materials and is therefore not reliant on petroleum. Researchers at the Fraunhofer Institute for Chemical Technology ICT in

Pfinztal and the Fraunhofer spin-off TECNARO GmbH have developed the material. But what exactly is liquid wood? “The cellulose industry separates wood into its three main components – lignin, cellulose and hemicellulose,” explains ICT team leader Emilia Regina Inone-Kauffmann. “The lignin is not needed in papermaking, however. Our colleagues at TECNARO mix lignin with fine natural fibers made of wood, hemp or flax and natural additives such as wax. From this, they produce plastic granulate that can be melted and injection-molded.”

Car parts and urns made of this bio-plastic already exist, but it is not suitable for toys in this form: To separate the lignin from the cell fibers, the workers in the cellulose industry add sulfurous substances. However, children’s toys should not contain sulfur because, for one reason, it can smell very unpleasant.

“We were able to reduce the sulfur content in ARBOFORM by about 90 percent, and produced Nativity figurines in cooperation with Schleich GmbH. Other products are now at the planning stage,” says TECNARO’s managing director Helmut Nägele. This is a challenging task: Sulfur-free lignins are usually soluble in water – and therefore unsuitable for toys. On no account must they dissolve if they are left out in the rain or if children suck them. With the aid of suitable additives, the TECNARO scientists were able to modify the bio-plastic in such a way that it survives contact with water and saliva undamaged. Can the material be recycled? “To find that out, we produced components, broke them up into small pieces, and re-processed the broken pieces – ten times in all. We did not detect any change in the material properties of the low-sulfur bio-plastic, so that means it can be recycled,” says Inone-Kauffmann.

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