LVE5

Session 2010

# BREVET DE TECHNICIEN SUPÉRIEUR

# ANGLAIS

## ¤ GROUPE 14 ¤

| *Spécialités* | *Durée* | *Coefficient* |
|---|---|---|
| *Chimiste* | ***2 heures*** | ***1*** |
| *Techniques physiques pour l'industrie et le laboratoire* | ***2 heures*** | ***2*** |

**DICTIONNAIRE BILINGUE AUTORISÉ.**

**L'USAGE DE LA CALCULATRICE EST INTERDIT.**

***Tout autre matériel est interdit.***

***Avant de composer, le candidat s'assurera que le sujet comporte bien 3 pages numérotées de 1/3 à 3/3.***

# Scientists create transparent, thin plastic strong like steel

by Staff Writers
Chicago (AFP) Oct 4, 2007

**Scientists have developed a transparent new plastic as strong as steel and as thin as a sheet of paper, according to a study published Thursday in Science magazine.**

**Made out of clay and a non-toxic glue similar to that used in school classrooms, the composite plastic is biodegradable and requires very little energy to produce, lead researcher Nicholas Kotov said.**
**"It's as green as you can imagine," he said, adding that the material is also quite cheap to produce.**
The plastic could be used to reduce the energy required to separate gasses in chemical factories, improve microtechnology such as microchips or biomedical sensors and even one day produce lighter, stronger armor for soldiers or police and their vehicles.
Kotov has already begun developing practical applications for the composite plastic which could become commercialized within a year or two.
"We're still at the exploratory stage but the machine is now being built in our lab to build pieces as big as one meter by one meter," he said in a telephone interview.
Producing a composite material out of nano-sized building blocks that can maintain its strength at such large sizes has long confounded scientists.
Kotov managed to do it by mimicking the brick-and-mortar molecular structure found in seashells.
His engineering team at the University of Michigan build a robot which stacks the nanosheets like bricks in an alternating pattern and uses a glue-like polymer to create cooperative hydrogen bonds between the layers that can easily reform in another place if the bond is broken.
It takes a few hours to build up the 300 layers needed to make a thin sheet of the plastic as the robot's arm dips in and out of vials of glue and a dispersion of clay nanosheets.
Mother of pearl, the iridescent lining of mussel and oyster shells, is built layer-by-layer like this. It's one of the toughest natural mineral-based materials.
"When you have a brick-and-mortar structure, any cracks are blunted by each interface," Kotov explained. "We've demonstrated that one can achieve almost ideal transfer of stress between nanosheets and a polymer matrix."

## COMPRÉHENSION

***I - Traduire en français le passage suivant :***

"... The glue-like polymer used in this experiment, which is polyvinyl alcohol, was as important as the layer-by-layer assembly process. The structure of the "nanoglue" and the clay nanosheets allowed the layers to form cooperative hydrogen bonds, which gives rise to what Kotov called "the Velcro effect." Such bonds, if broken, can reform easily in a new place."

*Extracted from New Transparent Plastic Strong As Steel, Ann Arbor MI (SPX), oct 08, 2007*

***II - Faire le compte-rendu du texte en français.***
(Entre 80 et 100 mots)

## EXPRESSION

### Answer the questions in your OWN words :

1. Explain the advantages of this new material and its possible uses according to the text and imagine one or two other applications.
(80 words)

2. Do you think humans have eventually understood that the Earth must be protected, or not ?
(120 words)