EASY SCIENCE

NANOTECHNOLOGY PUBLIC ENGAGEMENT

Recycle Kyle!

By Helene Shere

Reduce, reuse, recycle! I have got that slogan stuck in my head. I was watching a TV programme on Saturday, all about saving energy and recycling waste. While I was sitting in the lounge, having a cup of hot chocolate, I realised that we are doing very little at home, to help with recycling. I have made it my winter project to improve our recycling processes at home.

Why should we recycle paper?

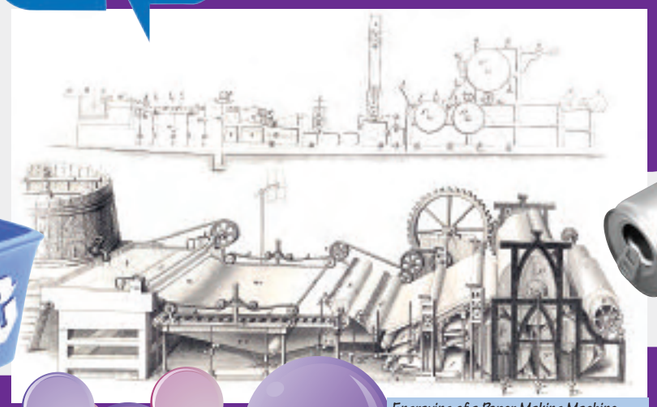
Paper pulp

During the paper-making process, lots of water is used and wasted. This leads to water pollution because bleach is used to make the paper white. If the bleach gets into natural water sources, it can kill the plants and animals living in the water. When we recycle paper we decrease the amount of water used by 60%, the pollution by 35% and we also save 40% more energy. This sounds like a good enough reason, don't you think? Thanks to nanotechnology, the making and recycling of paper, has also been made much safer. By adding nanoparticles to the pulp, it becomes smoother and saves energy during the mixing process. The nanoparticles also make the fibres of the paper stronger, for better recycling.

The big question is: What can I do to improve recycling?

In South Africa we have a waste law that states <u>where, when and how</u> all waste products should be dumped. I can help by doing the following:

- Putting my household waste out for collection on the right day. In our area the bins are cleaned on a Tuesday.
- Not dumping waste illegally in open areas. The waste could be poisonous and do great harm.
- Recycling products that can be used again.



Engraving of a Paper Making Machine, 1851 / Cyclopedia of Useful Arts. Vol. II

Did you know?

Recycling aluminium makes more money than recycling steel.

And batteries?

Batteries are examples of hazardous (dangerous) waste that is found at home. Batteries contain harmful chemicals that can be released in the water and the soil. That is why we must recycle our batteries. We have a battery bin at school for this purpose. Ask your school for one as well.

Philip Stiff, a member of the Project on Emerging Nanotechnologies team in America, has invented new lithium-ion nanomaterial batteries. These batteries will not only last longer, but will have fewer risks for the environment during the making and recycling processes. The scientists are also busy developing a car battery based on nano-engineering principles. This will make sure that cars are more eco-friendly.

Regular household batteries

Lithium-ion batteries

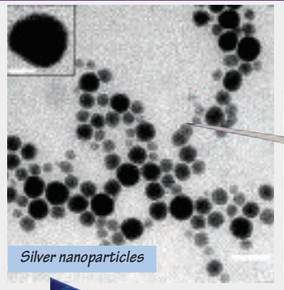
What is nanotechnology?

Nanotechnology is one of the approaches being explored in many countries, including South Africa, to tackle the challenge of providing clean water, amongst other things. Nanotechnology is the manipulation of materials at a very tiny scale – essentially at atomic and molecular levels. At the nanoscale, the normal rules of physics and chemistry often do not apply, and as a result many materials start to display unique, and sometimes, surprising properties.

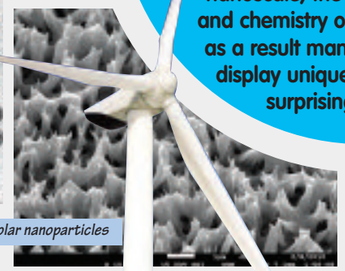
Recycling with Nanotechnology

Nanotechnology is being used in a lot of processes, making them safer! Here are only a few examples of such processes:

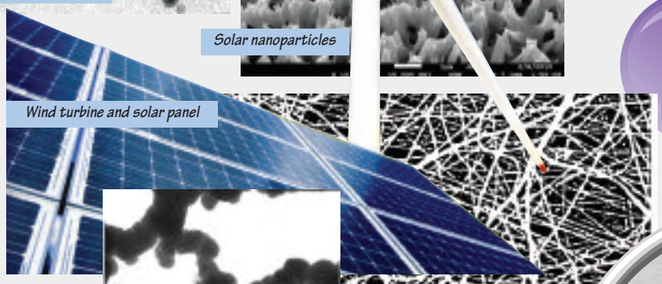
- Using silver particles in the making of detergents, which decreases pollution.
- Making solar cells that generate electricity much cheaper.
- Covering windmill blades with nanoparticles to make them stronger and increase the amount of electricity produced.
- Using iron nanoparticles to remove poisonous substances (organic solvents) from water.
- Using gold nanoparticles to remove dangerous gases (volatile organic compounds) from the air.



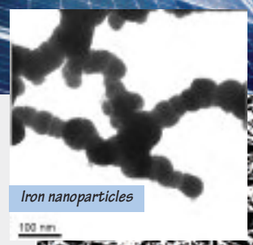
Silver nanoparticles



Solar nanoparticles



Wind turbine and solar panel



Iron nanoparticles

Gold nanoparticles

"Thank goodness for nanotechnology! It is good to know that there are still people in our world that care!"

What about metals?

Almost all metal products can be recycled, including food tins, spray cans and cooldrink cans. Recycling one aluminium can results in 97% less water pollution, 95% less air pollution and 95% less energy, than making a new can.

Did you know?

Every year each person uses about two trees worth of paper.

Car with battery based on nano-engineering principles

science & technology
Department: Science and Technology
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation | SAASTA South African Agency for Science and Technology Advancement

EasyScience is produced by the South African Agency for Science and Technology Advancement (SAASTA), a business unit of the National Research Foundation. SAASTA's mission is to promote the public's understanding, appreciation and engagement with science and technology among all South Africans.

Visit the website: www.saasta.ac.za for more information

EASY SCIENCE

NANOTECHNOLOGY
PUBLIC ENGAGEMENT

Paper-making activity

DIY Recycling

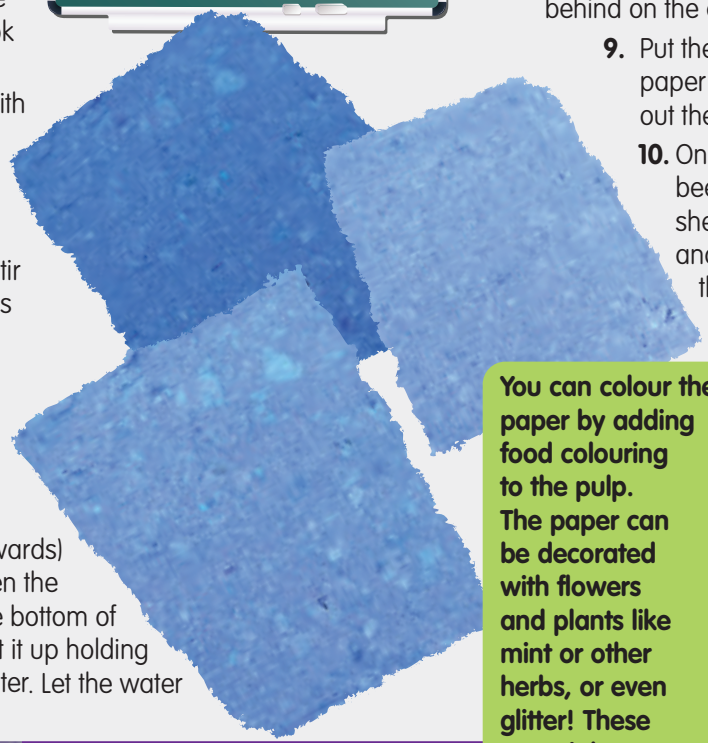
You will need:

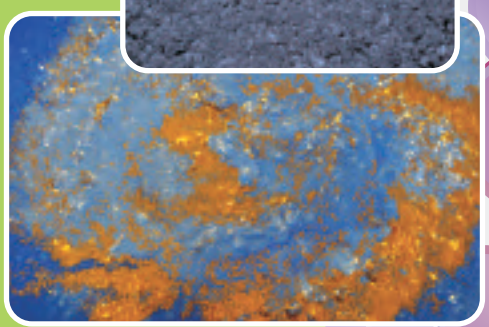
- ✓ waste paper
- ✓ a large bowl
- ✓ bucket
- ✓ water
- ✓ two flat wooden boards, bigger than the frame.
- ✓ a potato masher or electric beater.
- ✓ a cloth
- ✓ a wooden frame with a stocking or netting stapled to it.

Steps to follow:

1. Tear or cut waste paper (same type) into pieces about the size of a stamp. Put these pieces in the bucket.
2. Cover the paper with warm water and leave it to soak overnight.
3. Mash or beat the paper in the water to form a pulp. The mixture should look like porridge.
4. Half fill the bowl with water. The bowl must be larger than the frame. Add some pulp to the water. Gently stir the pulp so that it is spreads evenly in the water.
5. Spread the cloth out on one of the boards.
6. Lower the frame (netting facing upwards) into the bowl. When the frame is flat on the bottom of the bowl, slowly lift it up holding it level with the water. Let the water drain off.
7. Place the frame on the board covered with the cloth so that the paper is facing downwards. Use the cloth to gently wipe the netting to remove any extra water.

8. Carefully lift the frame leaving the paper behind on the cloth.
9. Put the other board on top of the paper and push down to squeeze out the water.
10. Once most of the water has been squeezed out, take the sheet of paper (still on its cloth) and put it in the sun to dry.





You can colour the paper by adding food colouring to the pulp. The paper can be decorated with flowers and plants like mint or other herbs, or even glitter! These materials must be pressed into the wet paper or mixed into the pulp before it dries. Your paper can be used to make writing paper, cards and wrapping paper!

science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation | SAASTA South African Agency for Science and Technology Advancement