

Biodegradable Plastics

Bronze Award

Plastic is everywhere from toys to clothing, buckets to bags! Manufacturing with plastic is extremely popular due to the wide variety of products that can be produced. **But the problem with plastic is what happens to it after we throw it away.**

Practical experiment



Project will roughly take between
10-15 hours (not including curing times)

Recommended age range **11-14 year olds**

#materials

#biodegradableplastic

Plastic is made of polymers, chemical structures which contain repeated subunits, these polymers can take years to break down and with such a large amount being produced, there simply isn't enough space or resources to keep manufacturing.

Resulting in 8 million tonnes of plastic entering our oceans each year, scientist believe by 2050, the amount of plastic in our oceans will weigh more than the entire population of fish in the ocean.

What is the problem with plastic? CBBC Newsround

400m

million tons of plastic
are produced each year

40%

of it being single use

How to run CREST using this activity

To use their project to achieve a CREST Bronze Award your student will need to:

- Complete a minimum of 10 hours of project times
- Consider the broader impact of their project and demonstrate an innovative approach
- Complete the project workbook or short report in another medium
- Reflect on their work during the project using a student profile form

Preparation

Ready to get going with CREST? Sign up for a CREST account here: www.crestawards.org/sign-in

Create a new Bronze award project with the name(s) of the student(s) and the title of their project. If you don't have all the details, you can fill these in later!

Run the project

We have some super handy workbooks and profiles for your students to use when running a CREST Award. You can download these when you create your CREST account by following the link above.

Encourage your students to use the workbook or profile to plan and carry out their project, keeping a record of all their amazing progress.

Make sure you consider safety and risks!

Reflection

So, your students have been hard at work and completed their CREST project, but don't let this be the end of their learning. They should now fill in any remaining sections of their workbook. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

Enter your project for a CREST Bronze Award

Hard work deserves a reward! Celebrate and certify your student's achievements by entering their project a CREST Bronze Award. Simply:

Log in to your CREST account at www.crestawards.org/sign-in

Select the project and upload a sample of the students' workbooks or other project evidence.

Check the participating students have met each of the criteria on the teacher assessment page.

Finally, complete the delivery and payment details to order your snazzy certificates.

Congratulations on completing CREST Bronze!

What next?

The scientific discovery doesn't need to end here. Students can have a go at the next level up – CREST Silver.

Don't keep all the fun to yourselves, encourage others to take part in CREST projects and share the wonders of science. For free ideas on how to get started, see www.crestawards.org



So what can we do?

Biodegradable plastics can be degraded by micro-organisms into water, carbon dioxide and biomass (plant or animal material). Bioplastics are different to conventional non-biodegradable plastics as they are produced from renewable resources, creating less toxic waste.



In recent years many bioplastic products have been produced as an alternative to petroleum based products such as food packaging, compostable bags and tableware.

Biodegradable plastics have the advantage of reduced CO₂ emissions, as well as being a cheap alternative to petrochemical plastics. Sadly biodegradable plastics cannot be recycled like other plastics and must be disposed of properly.



Aim

Identify and investigate the material properties of biodegradable plastic and whether it can be used as an alternative to a conventional single use plastic product.

Objectives

- Learn what biodegradable plastic is
- Learn the definitions of material properties
- Learn to compare and analyse material properties
- Identify and understand the meaning of single use plastic

Method

Identify and select one household product with single use non-biodegradable plastic packaging.

Please use the link below to create a gelatine based biodegradable plastic.

Gelatine bioplastic recipe

Health and safety



Warning: This project involves cooking please be careful when using the cooker as it does get very hot.

Warning: Please be careful when pouring plastic into container this may be hot and you could burn yourself.

Equipment

Based on a gelatine bio-plastic recipe:

For this experiment you will need

- Saucepan
- Spoon
- Kitchen scales
- Heat source (hob)
- Clean glass, plastic or aluminium board or mould
- 2 sheets of sandpaper
- Cold water (240ml)
- Gelatine (48g) – can be bought from any local supermarket
- Glycerol/glycerine (12g) – can be bought from any local supermarket/ pharmacy
- Food colouring (optional)



Results

Compare your bio-plastic samples against your selected single use plastic product, identify the material properties of each type of plastic. Please use the link [here](#) for material definitions.

Property	Biodegradable plastic-gelatine based	Other biodegradable plastic selected	Single-use plastic
Strong			
Tough			
Hardness			
Brittle			
Stiffness			
Elasticity			
Durability			
Waterproof			

What else should you take into account

- What other products on the market are currently manufactured from biodegradable plastic?
- What do you think will happen to your biodegradable plastic over time (for example, if you buried your plastic in the ground)?
- Why might a manufacturer look at using a bioplastic as opposed to a non-biodegradable plastic? What are the benefits?
- How long did it take to manufacture your bio-plastic (including setting time) and do you think this method of production can be used to manufacture large quantities of biodegradable plastic?
- Can your bioplastic be used as an alternative to a non-biodegradable plastic? If so, why?
- What problems might there be if all plastic was manufactured from renewable sources?
- If you had the chance to do further work on this project what else might you take into consideration/ do differently next time?

Things to think about

- What is biodegradable plastic?
- What is a single use plastic?

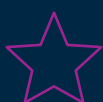


When identifying material properties, certain words can have specific meanings; for example, a material which is hard means it can't be easily scratched or dented.

Further work

Don't let the investigation finish there, have a go at other biodegradable plastic recipes and compare them against your gelatine based plastic.

[Bioplastic Cook Book by Anastasia Pistofidou – issue](#)



Recommended resources to submit your CREST project for a Bronze award

Use **Bronze workbook** or **student profile form**

