PLASTIC RECYCLING AND UTILIZATION DUE TO ITS XENOBIOTIC CHARACTERISTIC IN THE ENVIRONMENT

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ABSTRACT

Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural. Most plastics contain organic polymers. The vast majority of these polymers are based on chains of carbon atoms alone or with oxygen, sulfur, or nitrogen as well. PVC is one of the most widely used plastics. This application note details samples of PVC in the form of resin, thin films, gasket and pipe, which are to be prepared in cross section to a thickness of 1mm for general observation under optical light microscope. A percentage of the recycled pellets are then re-introduced into the main production operation. This closed-loop operation has taken place since the 1970s and has made the production of some plastic products amongst the most efficient operations today. The average size of plastic particles in the environment seems to be decreasing, and the abundance and global distribution of micro-plastic fragments have increased over the last few decades. However, the environmental consequences of such microscopic debris are still poorly understood.

INTRODUCTION

A plastic material is any of a wide range of synthetic or semi-synthetic organic solids that are moldable. Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural. Most plastics contain organic polymers. The vast majority of these polymers are based on chains of carbon atoms alone or with oxygen, sulfur, or nitrogen as well. The backbone is that part of the chain on the main "path" linking a large number of repeat units together. To customize the properties of a plastic, different molecular groups "hang" from the backbone (usually they are "hung" as part of the monomers before the monomers are linked together to form the polymer chain). Superhydrphobic surface materials can be used to transform into plastics(Erbil et al. 2003).

The structure of these "side chains" influence the properties of the polymer. This fine tuning of the properties of the polymer by repeating unit's molecular structure has allowed plastics to become an indispensable part of the twenty-first century world. Most plastics are durable and degrade very slowly; the very chemical bonds that make them so durable tend to make them resistant to most natural processes of degradation. However, microbial species and communities capable of degrading plastics are discovered from time to time, and some show promise as being useful for bioremediating certain classes of plastic waste.

The plastics industry manufactures polymer materials and offers services in plastics important to a range of industries, including aerospace, building and construction, electronics, packaging, and transportation. Plastic accumulation has been widely seen in global environments (Barnes et al. 2009).

MATERIALS AND METHODS

The first human-made plastic was invented by Alexander Parkes in 1862; he called this plastic Parkesine. The development of plastics has come from the use of natural plastic materials (e.g., chewing gum, shellac) to the use of chemically modified natural materials (e.g., rubber, nitrocellulose, collagen, galalite) and finally to completely synthetic molecules (e.g., bakelite, epoxy, polyvinyl chloride, polyethylene). In 1855, an Englishman from Birmingham named Alexander Parkes developed a synthetic replacement for ivory which he marketed under the trade name Parkesine, and which won a bronze medal at the 1862 World's fair in London.

Parkesine was made from cellulose (the major component of plant cell walls) treated with nitric acid and a solvent. The output of the process (commonly known as cellulose nitrate or pyroxilin) could be dissolved in alcohol and hardened into a transparent and elastic material that could be molded when heated.By incorporating pigments into the product, it could be made to resemble ivory (Harding et al. 2007).

Bois Durci is a plastic moulding material based on cellulose. It was patented, in Paris in 1855, by Lepage. It is made from finely ground wood flour mixed with a binder, either egg or blood albumen or gelatine. The wood is probably either ebony or rose wood, giving a black or brown result. The mixture is dried and ground to a fine powder. The powder is placed in a steel mould and compressed in a powerful hydraulic press whilst being heated by steam. The final product has a highly polished finish imparted by the surface of the steel mould.

Plastics are used widely in many industrial applications. Particularly Polyvinyl Chloride or PVC has a variety of uses from home exterior rain gutters to plasma bags in the medial industry. PVC is one of the most widely used plastics. This application note details samples of PVC in the form of resin, thin films, gasket and pipe, which are to be prepared in cross section to a thickness of 1mm for general observation under optical light microscope. Using the materials and detailed methods listed below sample preparation was kept to a minimum for the level of detailed needed. a class of tunable microfluidic fiber device that uses molded plastic microchannels and electrowet- ting pumps (Hsieh et al., 2003). However, additional observation might be needed under the scanning electron microscope.

Table 1: The following equipment and consumable items were used for the preparation of plastic

Equipment	Description
Model 650 Low speed diamond wheel saw with 4”, .012” thickness, coarse/high diamond cut off wheel	The Model 650 Low Speed Diamond Wheel Saw is a compact, multipurpose, precision saw designed to cut a wide variety of materials with minimal subsurface damage
Model 920 8” Lapping and Polishing Machine.	The Model 920 is a multi purpose grinding and lapping machine designed for accurately lapping and polishing a

	wide range of materials.
70 degree mounting wax	Sticky type orange colored wax used to hold a variety of materials while being sliced lapped and polished.
400 grit, 600grit, 1000grit, 1200 SiC paper discs. (optional) 1um Diamond abrasive film disc.	Used in the polishing process to removed scratches from slicing process.
AcryliMet cold mounting system	A 2-part quick setting epoxy sample mounting system

Steps of method:

1. Samples were mounted using AcryliMet epoxy cold mounting system. Samples cured in 30 minutes.

2. Samples were mounted for slicing using 70 degree mounting wax and sliced to less than 1.5mm using the Model 650 low speed diamond wheel saw. Individual slices took about 15 minutes per slice with a load of 150 grams. A coarse diamond size, high concentration diamond wheel was used to give the best balance of cut time and cut finish.

3. Short polishing times of 1-2 minutes were convenient using the Model 920 polisher and SiC papers: grits sizes 400, 600 1000, 1200. Samples were held without use of polishing device.

4. (Optional) A short final polish by hand, no rotation, using 1um diamond film allow for expedient sample processing with good surface finish.

5. Samples were clean thoroughly with $H2O$ to remove any abrasive particle from the polishing process. Additionally, all solvents were avoided because of the deformation

they could possible cause.

DISCUSSION: XENOBIOTIC NATURE AND RECYCLING OF PLASTIC

A xenophobic is a foreign chemical substance found within an organism that is not normally naturally produced by or expected to be present within that organism. It can also cover substances which are present in much higher concentrations than are usual. Specifically, drugs such as antibiotics are xenobiotics in humans because the human body does not produce them itself, nor are they part of a normal diet.

Natural compounds can also become xenobiotics if they are taken up by another organism, such as the uptake of natural human hormones by fish found downstream of sewage treatment plant outfalls, or the chemical defenses produced by some organisms as protection against predators.

However, the term xenobiotics is very often used in the context of pollutants such as dioxins and polychlorinated biphenyls and their effect on the biota, because xenobiotics are understood as substances foreign to an entire biological system, i.e. artificial substances, which did not exist in nature before their synthesis by humans. Plastic forms are considered to be xenobiotic and non-degradable.

Thus, the present idea is plastic recycling which is the process of recovering scrap or waste plastic and reprocessing the material into useful products, sometimes completely different in form from their original state. For instance, this could mean melting down soft drink bottles and then casting them as plastic chairs and tables. Plastics are also recycled/reprocessed during the manufacturing process of plastic goods such as polyethylene film and bags. A percentage of the recycled pellets are then re-introduced into the main production operation. This closed-loop operation has taken place since the 1970s and has made the production of some plastic products amongst the most efficient operations today. Life assessment of plastic packaging and recycling system has been done by Arena et al. 2003.

CONCLUSION: PLASTIC ACCUMULATION NEEDS TO BE PROHIBITED FROM THE ENVIRONMENT

One of the most ubiquitous and long-lasting recent changes to the surface of our planet is the accumulation and fragmentation of plastics. Within just a few decades since mass production of plastic products commenced in the 1950s, plastic debris has accumulated in terrestrial environments, in the open ocean, on shorelines of even the most remote islands and in the deep sea. Annual clean-up operations, costing millions of pounds sterling, are now organized in many countries and on every continent. Here we document global plastics production and the accumulation of plastic waste. While plastics typically constitute approximately 10 per cent of discarded waste, they represent a much greater proportion of the debris accumulating on shorelines.

Mega- and macro-plastics have accumulated in the highest densities in the Northern Hemisphere, adjacent to urban centres, in enclosed seas and at water convergences (fronts). We report lower densities on remote island shores, on the continental shelf seabed and the lowest densities (but still a documented presence) in the deep sea and Southern Ocean. The longevity of plastic is estimated to be hundreds to thousands of years, but is likely to be far longer in deep sea and non-surface polar environments. Plastic debris poses considerable threat by choking and starving wildlife, distributing non-native and potentially harmful organisms, absorbing toxic chemicals and degrading to micro-plastics that may subsequently be ingested.

Well-established annual surveys on coasts and at sea have shown that trends in mega- and macro-plastic accumulation rates are no longer uniformly increasing: rather stable, increasing and decreasing trends have all been reported. The average size of plastic particles in the environment seems to be decreasing, and the abundance and global distribution of micro-plastic fragments have increased over the last few decades. However, the environmental consequences of such microscopic debris are still poorly understood.

Thus plastic which is non-degradable should be continuously recycled and further preparation of plastics in industries should be prohibited.

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