

POLYMER - OUR SAVIOUR DURING COVID-19 PANDEMIC

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Abstract – Polymers are a boon to mankind. We cannot imagine our lives without them. They are not our enemies nor toxic to the environment, it has diverse applications/advantages in the various sectors of engineering sciences, technologies, agriculture, medical, aerospace, automotive and defense industries.

Polymers or plastic materials have played a very important role in saving the life of humans in situation of COVID-19 or Coronavirus disease. The process of medical healthcare in the COVID-19 pandemic involves some steps- detection, analysis, diagnosis, hospitalization and cure. In these cases, huge number of equipment and special devices are used which are made out of polymers. The present work aims to highlight the use of polymers or plastic materials during this pandemic situation.

Key Words: applications, polymers, plastic materials, COVID-19, Coronavirus disease, equipment

1. INTRODUCTION

Polymers are a large class of materials, which are consisting of repeating units(monomers). When the monomers are linked together they form long chains and they are used in a lot of products and goods that we use in daily life. For example, toothbrush, bucket, PET bottles, disposable cups, plastic straws, plastic bags, tires, plates are used by all of us on a daily basis.

The COVID-19 pandemic is unpredictable. It is highly contagious and spreads through contaminated objects, direct touch and respiratory droplets (the virus is spreads mainly from person-to-person, when a person is in close contact i.e. within 1 m / about 6 feet with someone who has respiratory infection i.e. coughing or sneezing).

Medical professionals namely Doctors, Nurses, Paramedics and others who are working in this situation are at high risk of getting infected. Therefore, taking precautions is must. To protect themselves and other people from this pandemic, Personal Protective Equipment (PPE) kit is used. PPE consists of head cover, goggles, mask, face shield, gloves, shoe covers and overall gown which covers our entire body, right from head to toe (shown in the fig 1). PPE kit provides protection to the skin from coming in contact with the infected people or materials.

The objective of the present work is to illustrate, the applications of polymers for making head cover, goggles, mask, face shield, gloves, shoe covers, swabs, outer body of oximeter and temperature check machine etc.



Fig -1: PPE kit

2. PROCEDURE

The present work is based on a survey of types of polymers/materials are used in making various Personal Protective Equipment. The articles, papers which are submitted and published during this period are analysed for study.

3. EQUIPMENTS AND POLYMER USED

The COVID-19 pandemic has impacted a lot in the all productive sectors. Use of PPE kit, especially mask- which were previously mandatory for health professionals, and now it is mandatory for the rest of the population to protect from the virus/infection. PPE kits are mostly made of synthetic polymer material. In all of them, there was and there is a common element: the use of polymer material.

3.1 Oximeter and Temperature Check Machine

Outer body of oximeter (shown in the fig 2) and temperature check machine (shown in the fig 3) is made up of polymer/plastic. Oximeter is used for checking oxygen. Temperature check machine is used for checking temperature.



Fig -2: Oximeter



Fig -3: Temperature check machine

3.2 Swabs

Swabs (shown in the fig 4) made from polypropylene (PP) and polyester. PP is used for stick and polyester is used for absorbent. Swabs are used for oral/nasal testing.



Fig -4: Swabs

3.3 UTM sample tube

In the UTM sample tube (shown in the fig 5), the cap is made up of polyethylene (PE). This material provides an airtight cap, so that there is no fear of leakage. UTM sample tube is used for collecting the sample.



Fig -5: UTM sample tube

3.4 Head Covers

Head covers (shown in the fig 6) are made up of polyethylene(PE) film, polypropylene(PP) film. These materials are preferred for its light weight and have excellent water repellency and air permeability, thereby providing comfort. The head cover is used to protect our hair as well as neck from virus contamination.



Fig -6: Head Cover

3.5 Goggle

Goggles (shown in the fig 7) are made up of polycarbonate(PC). PC is Thinner, lighter and noncorrosive. Goggles helps to reduce exposure to a variety of eye hazards and avoid virus transmission through the eyes.



Fig -7: Goggle

3.6 Mask

Multi-layered masks (shown in the fig 8) are made from polypropylene (PP) nonwoven and nanofiber. PP is used because it is non-toxic, breathable, water-resistant and provides a barrier for particles and virus.



Fig -8: Mask

3.7 Face shield

Face shield (shown in the fig 9) made from polyethylene terephthalate (PET) or polyethylene terephthalate glycol (PETG), acetate and polycarbonate(PC). These materials

provides excellent optical quality, chemical resistance, heat resistance and impact resistance. Face shield protects our entire face from chemical splashes and potentially infectious materials.



Fig -9: Face Shield

3.8 Gloves

Gloves (shown in the fig 10) made from natural rubber latex, nitrile rubber, neoprene, polyvinyl chloride (PVC) and polyurethane. Gloves should be flexible, dust free and non sticky. Gloves are used to avoid transmission of virus/infection.



Fig -10: Gloves

3.9 Shoe covers

Shoe covers (shown in the fig 11) are made from polypropylene (PP) non woven fabric. PP is used because it is non-toxic and water-resistant. Shoe covers provides safety against bacteria, virus, germs and keeps the work environment dust free.



Fig -11: Shoe Cover

3.10 Gown

Gown (shown in the fig 12) covers the full body, right from top to bottom. Disposable gown made from polyester,

polypropylene (PP), polyethylene (PE). Reusable gown are made from polyester/Cotton blends. These materials are used because they are water-resistant (barrier to liquid). Gown are used to protect both the patient and caregivers from the transfer of microorganisms, infection, virus etc.



Fig -12: Gown

3.11 Ventilator

Ventilator (shown in the fig 13) includes valves, switches, adapters, housing, etc. these are made from polyether ether ketone (PEEK), polyethylenimine (PEI), polyoxymethylene-C (POM-C), polypropylene (PP) component, polyethylene (PE) film. Materials which are required for making ventilators must be easy to machine, bio-compatible and chemically stable. Ventilator is used to provide oxygen to the patients.



Fig -13: Ventilator

3.12 Disposable bags/ Medical waste bag/ Body covers

Infected/ Used PPE kits, injections, medical kits etc are disposed with the help of disposable bags/ medical waste

bag (shown in the fig 14). Even the dead bodies are covered in a leak-proof transparent white or black plastic bag/ body covers (shown in the fig 15). These bags, covers, wraps are made from linear low-density polyethylene (LLDPE), low-density polyethylene (LDPE), polypropylene (PP), ethylene-vinyl acetate (EVA), poly(ethylene-vinyl acetate) (PEVA). These materials have the strength, stiffness, water-resistivity and dimensional stability.



Fig -14: Disposable bags/ Medical waste bag



Fig -15: Bag for dead bodies

4. CONCLUSIONS

1. Products which are made from the plastic materials are a boon for the medical industry, especially during this COVID - 19 pandemic.
2. PPE kits have saved lives of many people.
3. In this situation, polymer or plastic materials have an inherent advantage, of being recycled.
4. We must use these materials efficiently and then dispose them off well, so that they do not cause any pollution and harm to our environment and our society.

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