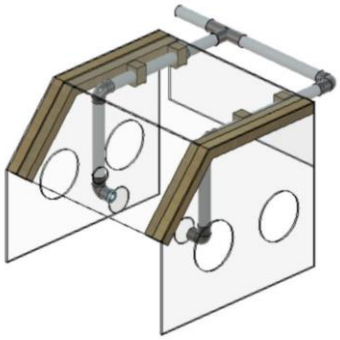
MATERIAL SELECTION FOR PROTOTYPE OF INTUBATION ISOLATION BOX

The box is intended to serve medical professionals for performing endotracheal intubation procedures. Most important feature required for this box is its transparency. The first option that pops up in every mind is glass. But there are several drawbacks associated with glass, the most significant drawbacks being its weight and low scratch resistance.

CAD Model of the Prototype:



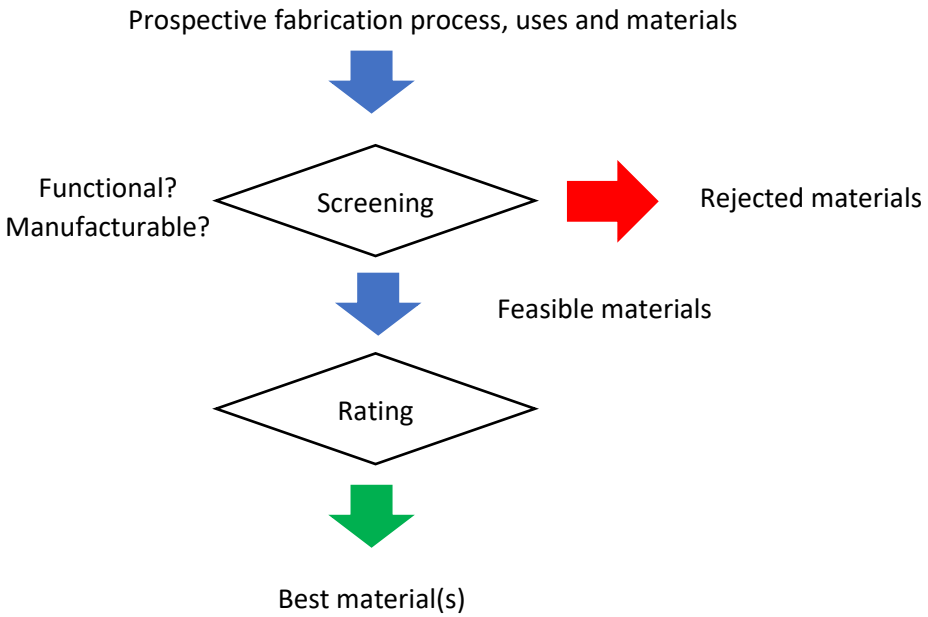
Thus, in order to select material for an intubation isolation box, following properties will be evaluated through Cambridge Engineering Selector (CES):

1. Optical properties
    - Transparency- A higher optical quality is required as the healthcare professionals have to clearly see through the box for longer durations for carrying out intricate intubation procedures. It will ensure excellent light transmission across the box.

2. Mechanical properties
    - Toughness- The material selected for the box must have the ability to absorb energy and plastically deform without fracturing.

3. General properties
    - Density- The hospital needs to move the box to a different bed every time. A lower density is required because the box needs to be light-weight so that it can be easily mantled and dismantled and is portable.
    - Price- From the literature survey conducted, it is seen that according to QFD, the setup must be economical.

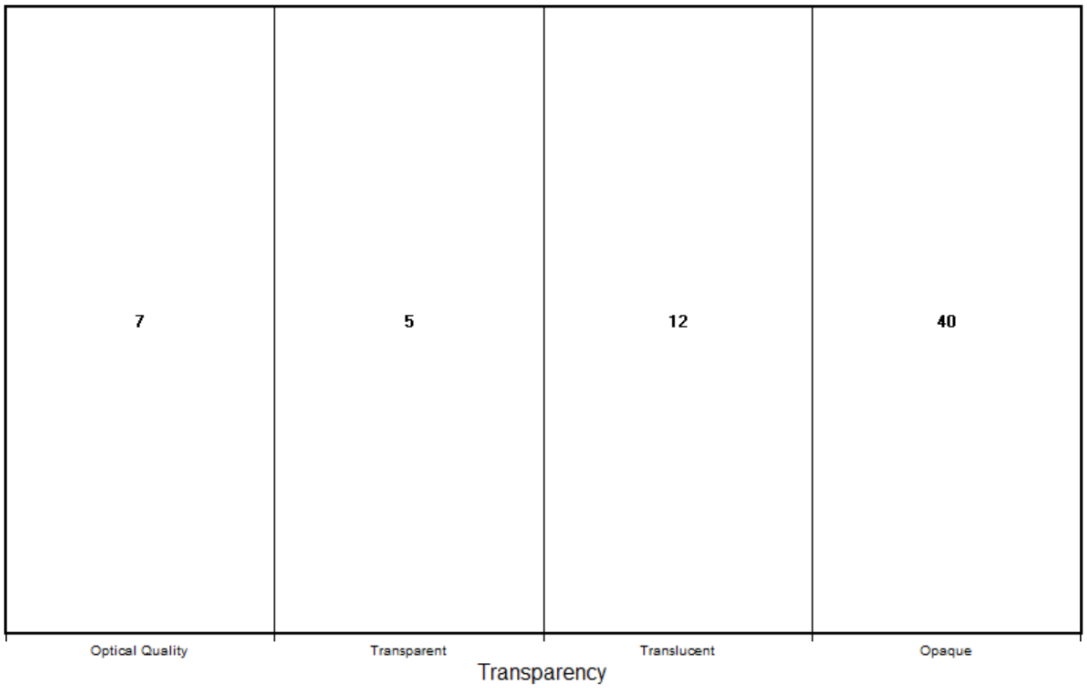
Process of material selection



The library of CES Edupack 2005 has 64 Material sets.

INDEPENDENT PLOTS OF EACH PROPERTY

1. Transparency



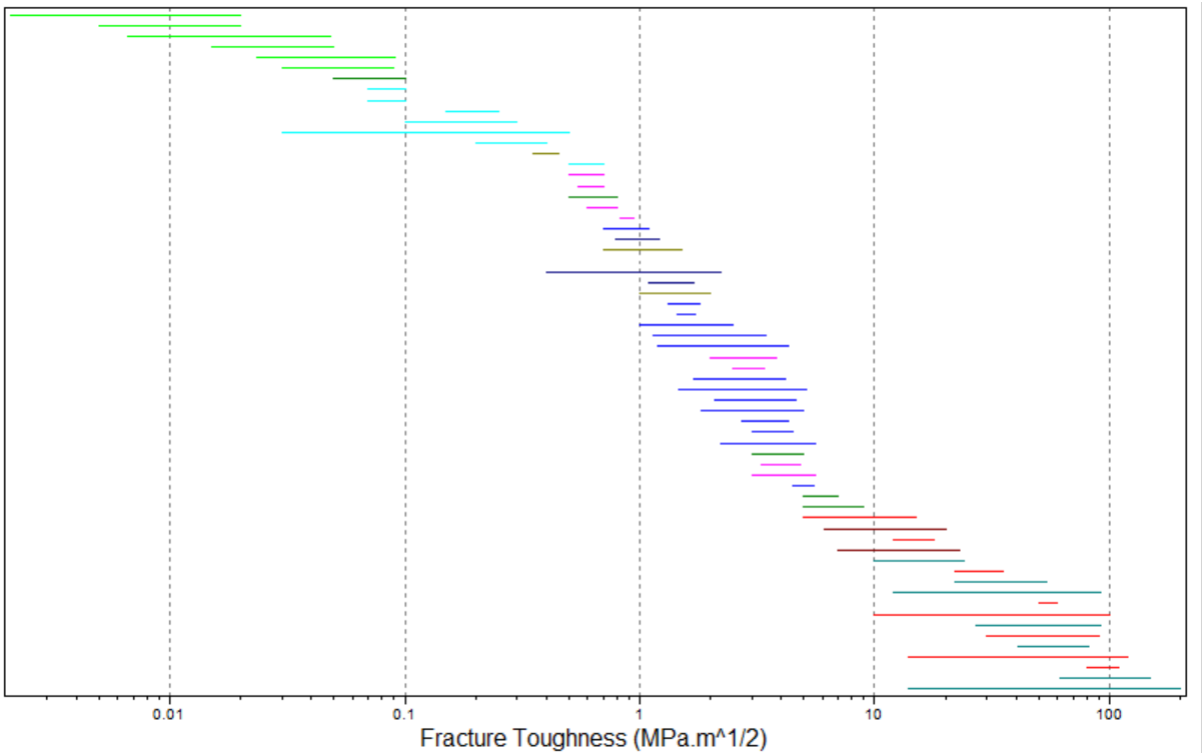
Most feasible materials:

7 out of 64 records in cell

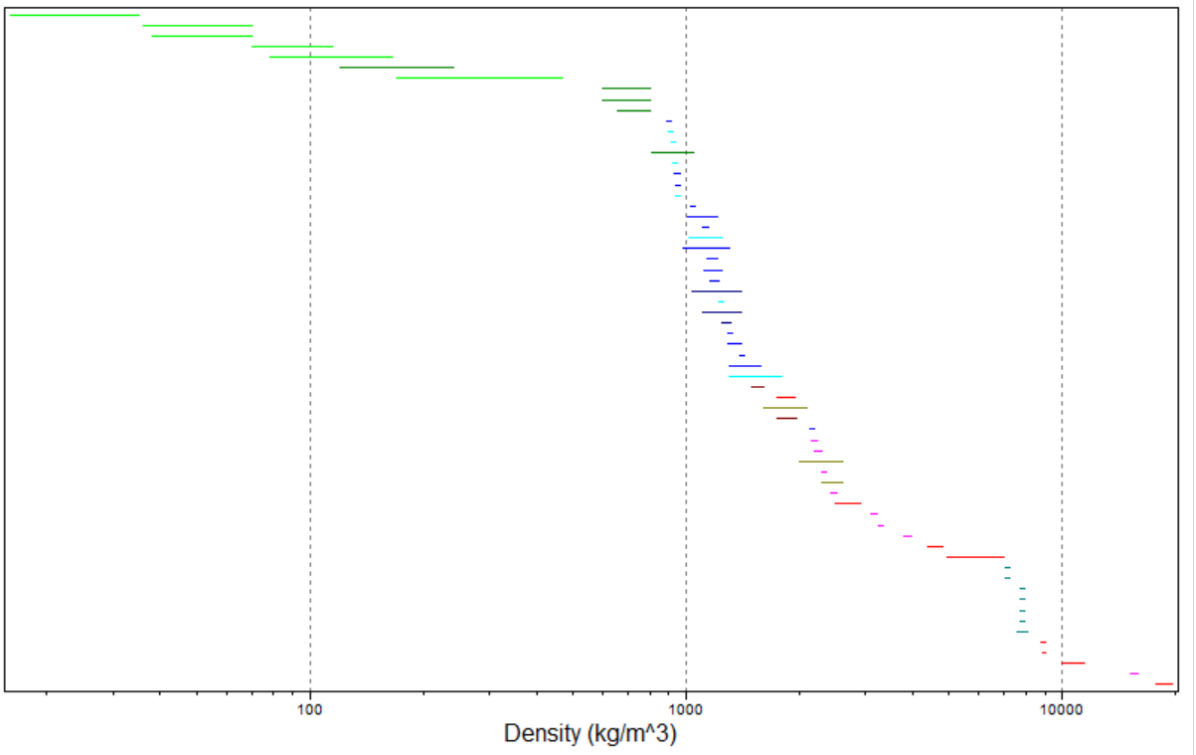
Name
Borosilicate glass
Cellulose polymers (CA)
Polycarbonate (PC)
Polymethyl methacrylate (Acrylic, ...
Polystyrene (PS)
Silica glass
Soda-lime glass

Since these 7 materials fall in the desired range of transparency, further analysis will be carried out based on these 7 materials only as the optical quality is the most important property of the setup.

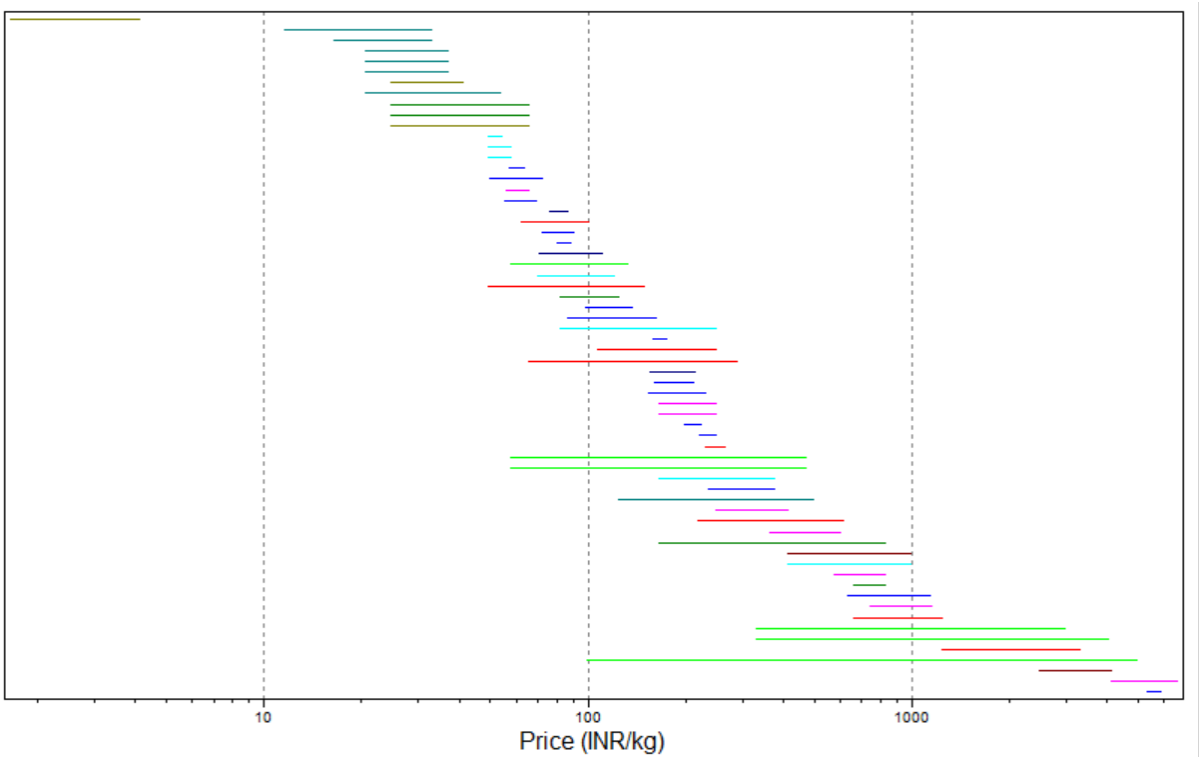
2. Toughness



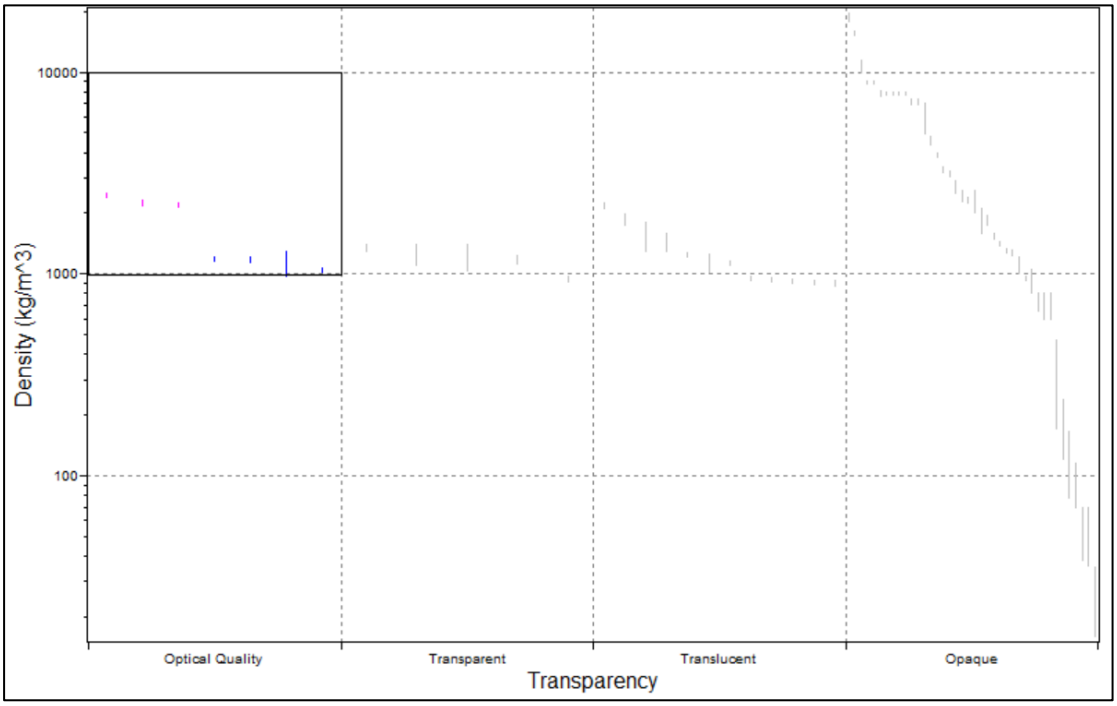
3. Density



4. Price

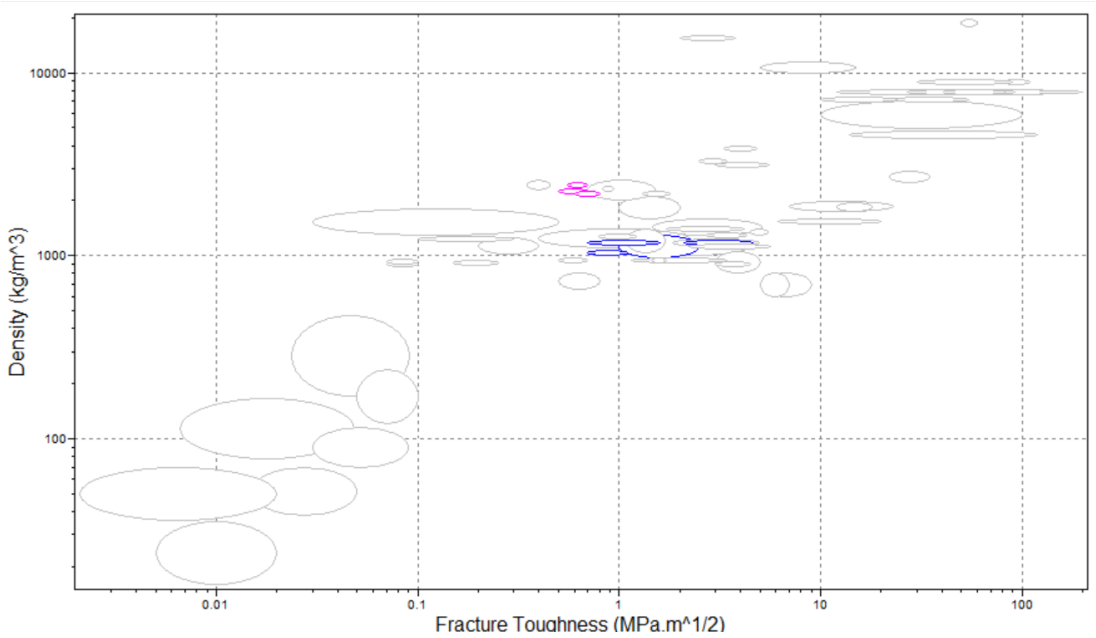


STAGE 1: TRANSPARENCY vs DENSITY



Stage 1		7 of 64 pass
Borosilicate glass	Optical Quality	2200 - 2300
Cellulose polymers (CA)	Optical Quality	980 - 1300
Polycarbonate (PC)	Optical Quality	1140 - 1210
Polymethyl methacrylate (Acrylic, ...	Optical Quality	1160 - 1220
Polystyrene (PS)	Optical Quality	1040 - 1050
Silica glass	Optical Quality	2170 - 2220
Soda-lime glass	Optical Quality	2440 - 2490

<u>STAGE 2:</u> FRACTURE TOUGHNESS vs DENSITY

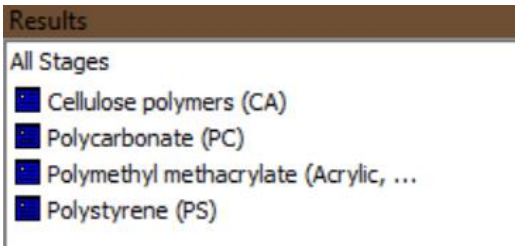


For stage 2, I reviewed only those materials that passed the primary criteria of optical quality. I selected the "Results Intersection Option" and was thus, able to view the 7 out of 64 options.

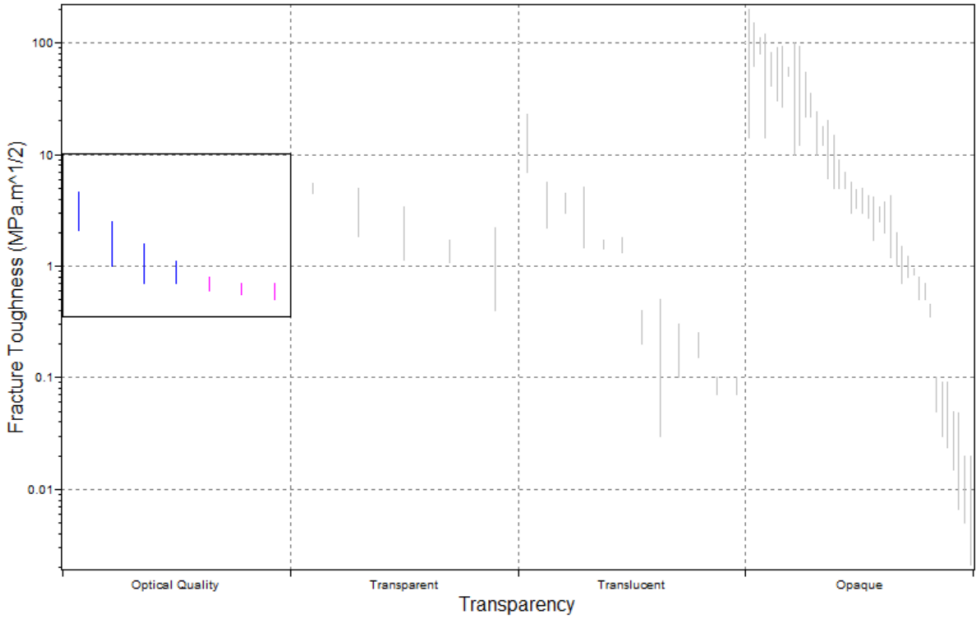
From Stage 2, I observed that Borosilicate glass, Soda lime glass and Silica glass have higher density as compared to Cellulose polymers, Polycarbonate, Polymethyl methacrylate and Polystyrene.

So, after stage 2, I have narrowed down the materials suitable for box constructions to 4:

- Cellulose polymers,
- Polycarbonate,
- Polymethyl methacrylate
- Polystyrene.

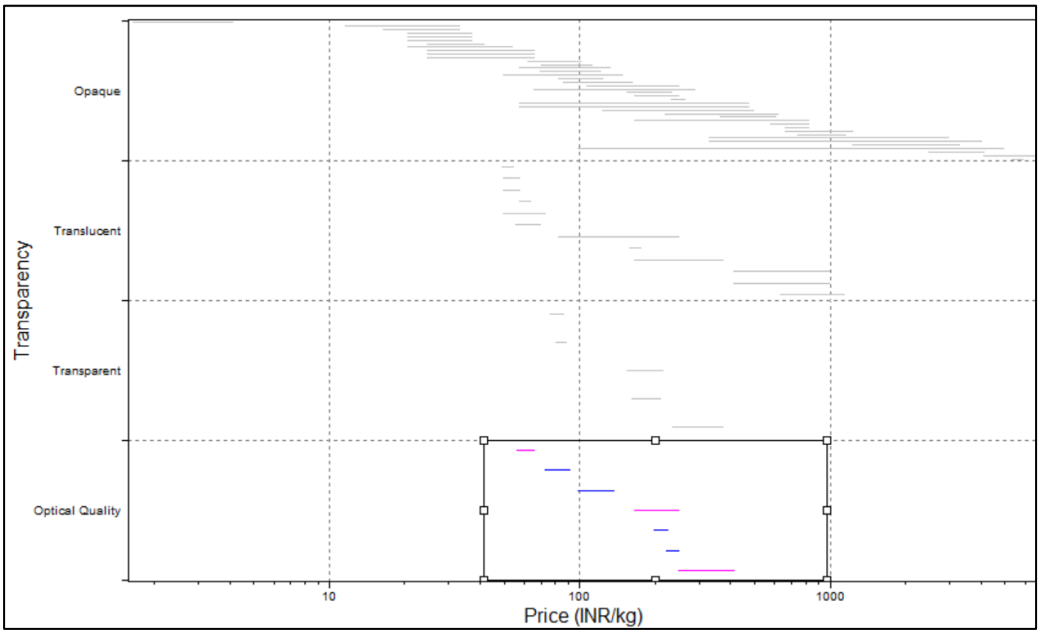


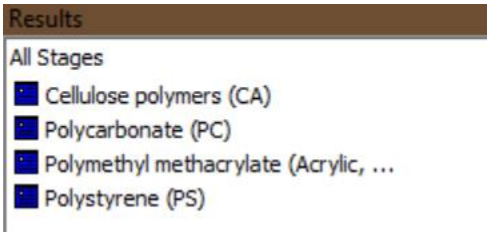
STAGE 3: TRANSPARENCY vs FRACTURE TOUGHNESS



From stage 3, it is seen that the four materials shortlisted in stage 2 i.e. to Cellulose polymers, Polycarbonate, Polymethyl methacrylate and Polystyrene have considerable fracture toughness, greater than 1 MPa/m2.

STAGE 4: PRICE vs TRANSPARENCY





CONCLUSION:

According to the above analysis for material selection, the shortlisted materials for the prototype are: