SAY NO TO PLASTIC

YES TO PAPER BAGS

B B VERMA

DEPT. OF METALLURGICAL

AND MATERIALS ENGINEERING

National Institute of Technology Rourkela

JUTE AND COTTON FIBER REINFORCE PAPER LAMINATES AND THEIR CHARACTERIZATION

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Present talk has two distinct components

1. Plastic bag induced pollution
2. Laminated paper composite : Fabrication and characterization.

Next time you do the shopping and carry home the things in a cute, comfy plastic carry-bags

Think !

You are contributing your share to a deadly pollution whose ill-effects are irreversible and capable of reaching out to several generations to come

Plastic is the material that is being used widely as packaging material

The problem comes from indiscriminate use and subsequent disposal, particularly the throw away plastic material used in wrapping and packaging

Facts about plastic shopping bags

- Four to five trillion plastic bags are manufactured each year.

  They take around 300 years to photo-degrade
- Recycling of plastic is very uneconomical, dirty, labor-intensive and health hazardous
- They pollute water bodies and cause floods by blocking drains

- Cows roaming on Indian streets die after chewing plastic bags containing scrap of foods
- When burned, plastic releases a host of poisonous chemicals into the air, including dioxin (carcinogenic pollutants) Drained bags during rainfall ends up in the sea and ocean
- A recent study concluded that in excess of 1 lakh marine mammals die needlessly each year

- Any attempt to get rid of plastic through landfills is also dangerous.

- They do obstructs the movement of roots thereby badly affecting the soils biological balance.

- Plastic bags amongst the top 12 coastline pollutants
- India's plastics consumption is one of the highest in the world. Yet, preciously little has been done to recycle, reuse and dispose them

The only way out of the deadly and lasting danger of plastic is to cut down the use of plastic, if not avoid it altogether

Say no to plastic whenever and wherever you can

Environmentalists all over the world want to see the return of biodegradable packaging materials such as;

Jute, Cotton, Paper etc.

- **Bleached and unbleached Kraft papers and Old Newspapers (ONP)**

- **Low strength and poor tear resistance of Kraft paper and ONP are major hurdles in their use as widely acceptable wrapping and packaging material**

Objective

The present study incorporates

- The development of continuous jute reinforced laminated paper composite
- Their characterization

- The development of cotton fabric reinforced laminated paper composite
- Their environmental aging and characterization.

Experimental

Materials

- **Kraft papers**
- **An ONP** (old news paper)
- **Reinforcing materials: jute fiber and cotton fabric**
- **Starch based glue**

Processing

Fabrication of fiber free laminate

Fabrication of Jute Fiber reinforced composite

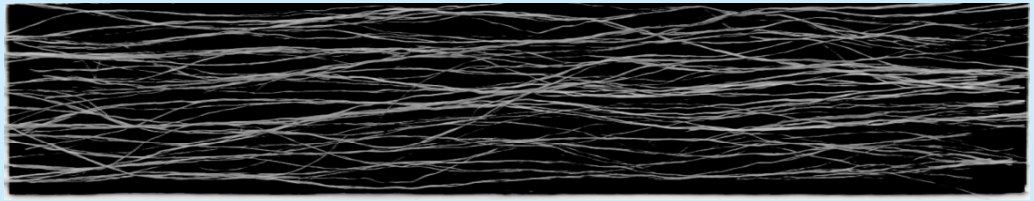
Fabrication of cotton fabric reinforced composite

Fabrication: Hand laying method

Characterization

- **Characterization of fabricated laminate and composite were done by conducting tensile test**

- **The test were done using *Instron 1195* m/c with a 50 *kN* load cell**



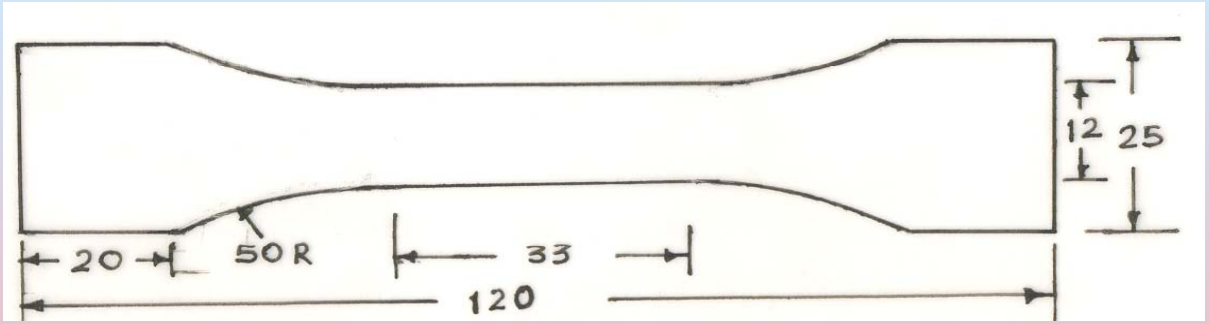
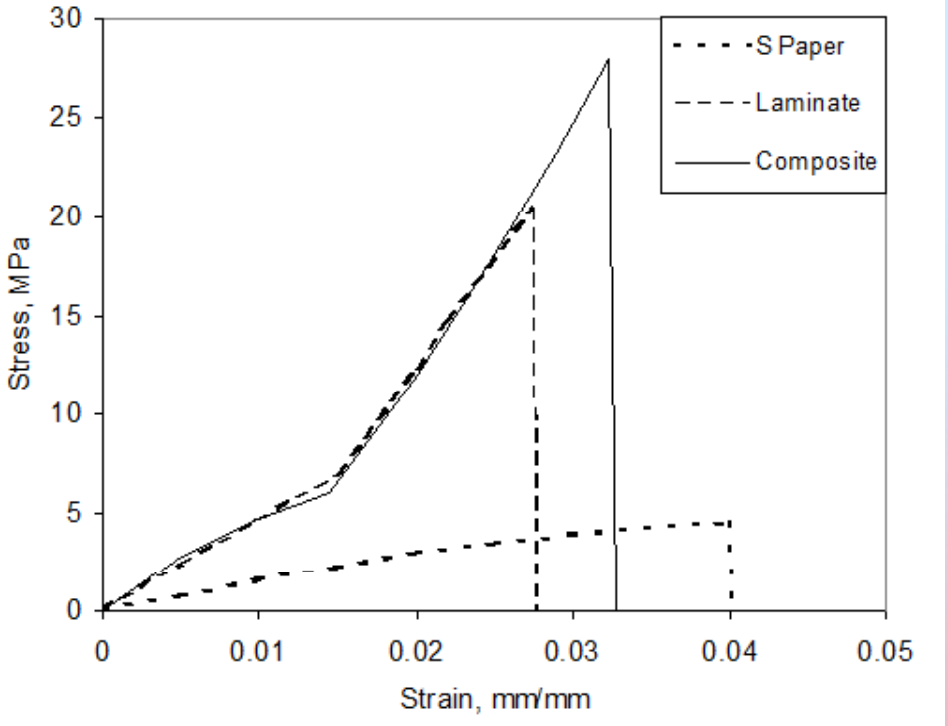
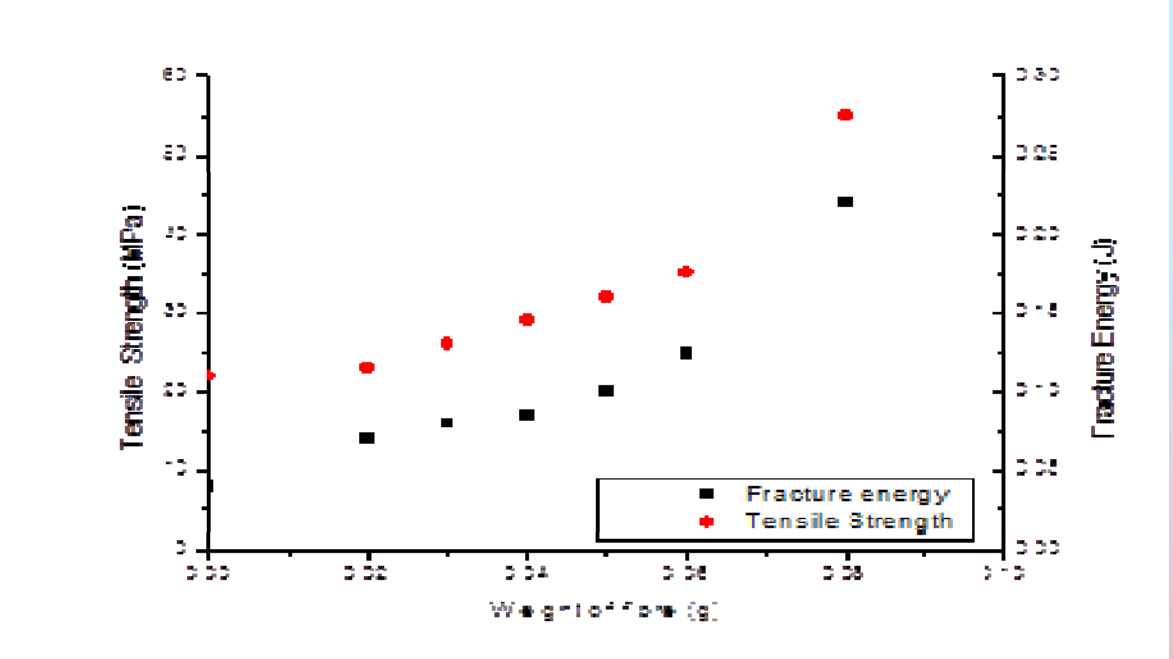


Fig.1 (*a*) Fiber distribution on paper surface, (*b*) dimensional details (in mm) of tensile test specimen

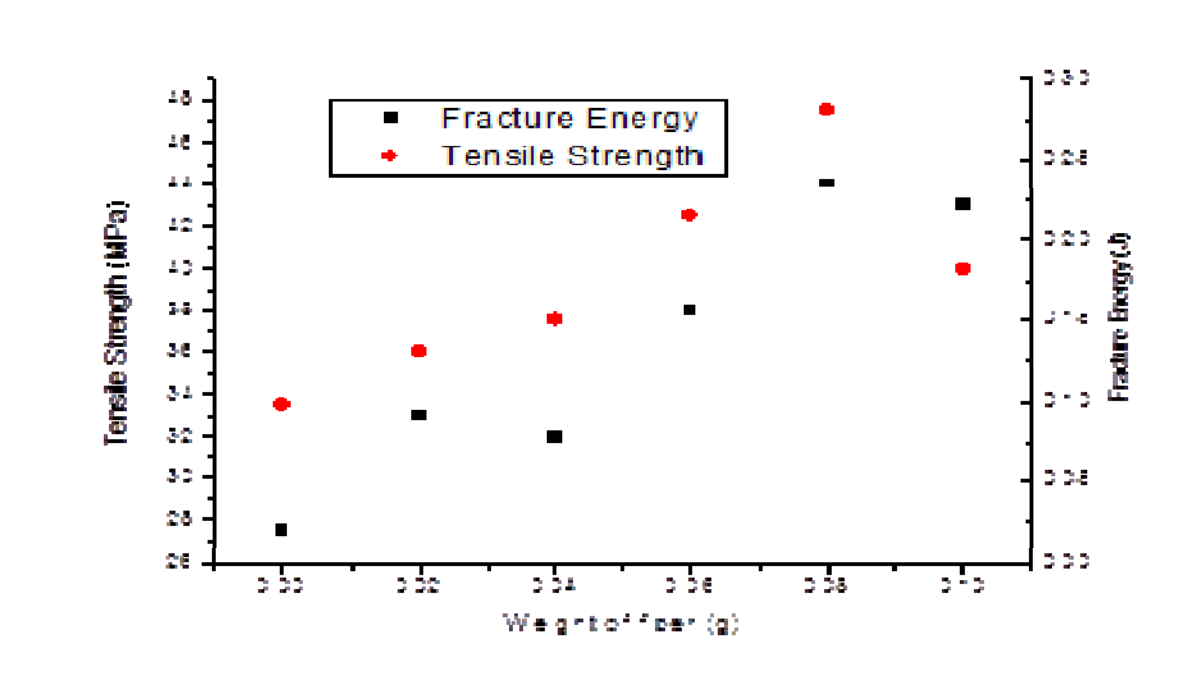
Result & Discussion



Typical diagrams illustrating the tensile behavior of single paper strip , reinforcement free laminate and jute fiber reinforce composite



Weight of fibre vs tensile strength and fracture energy in bleached Kraft paper–fibre composite.



Weight of fibre vs tensile strength and fracture energy in Unbleached Kraft paper–composite.

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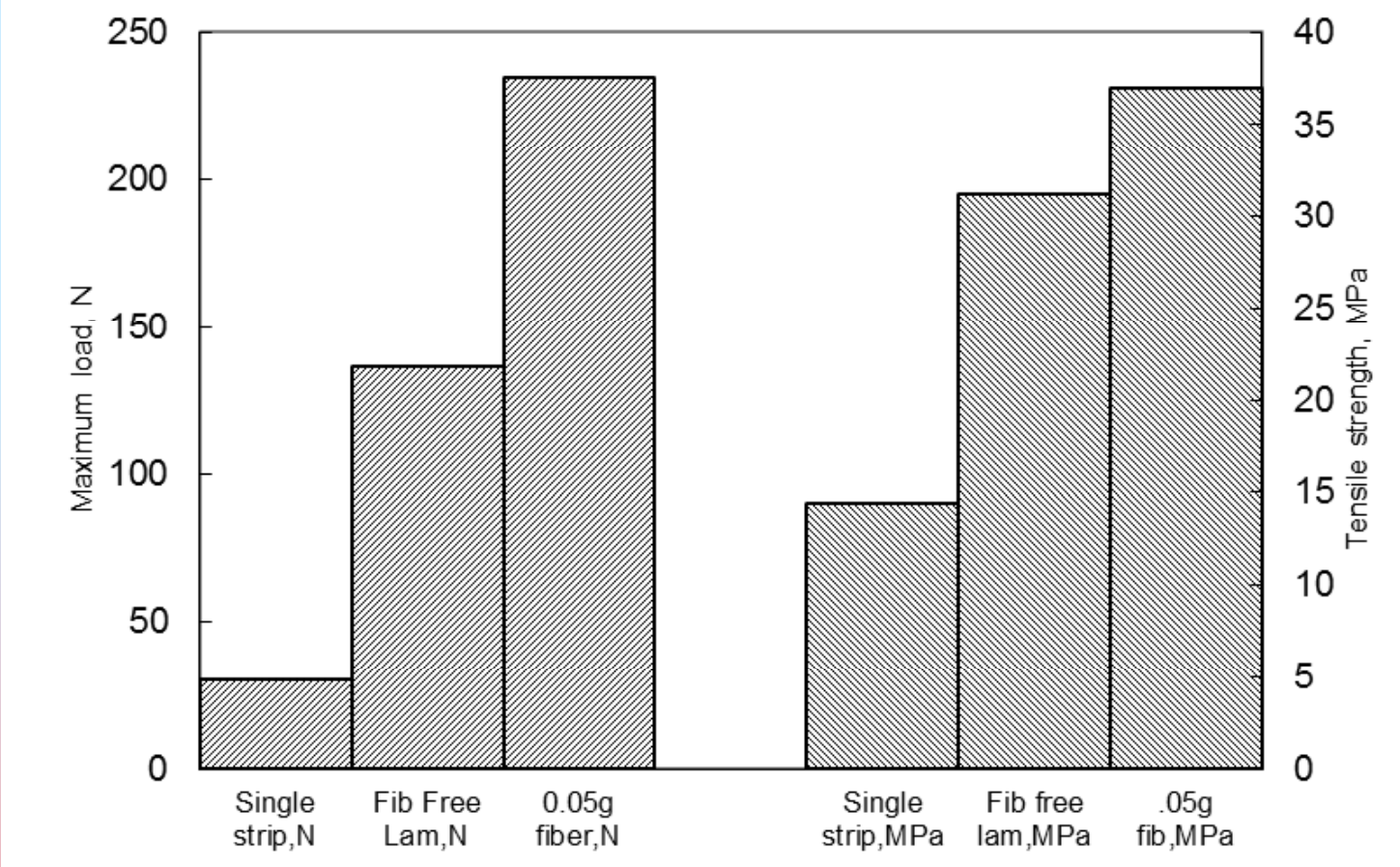
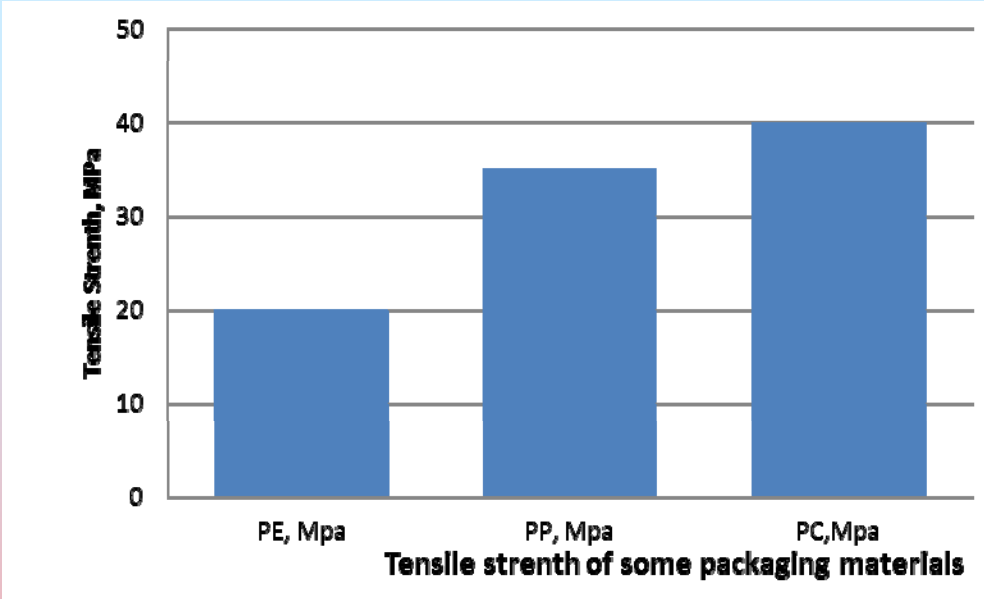
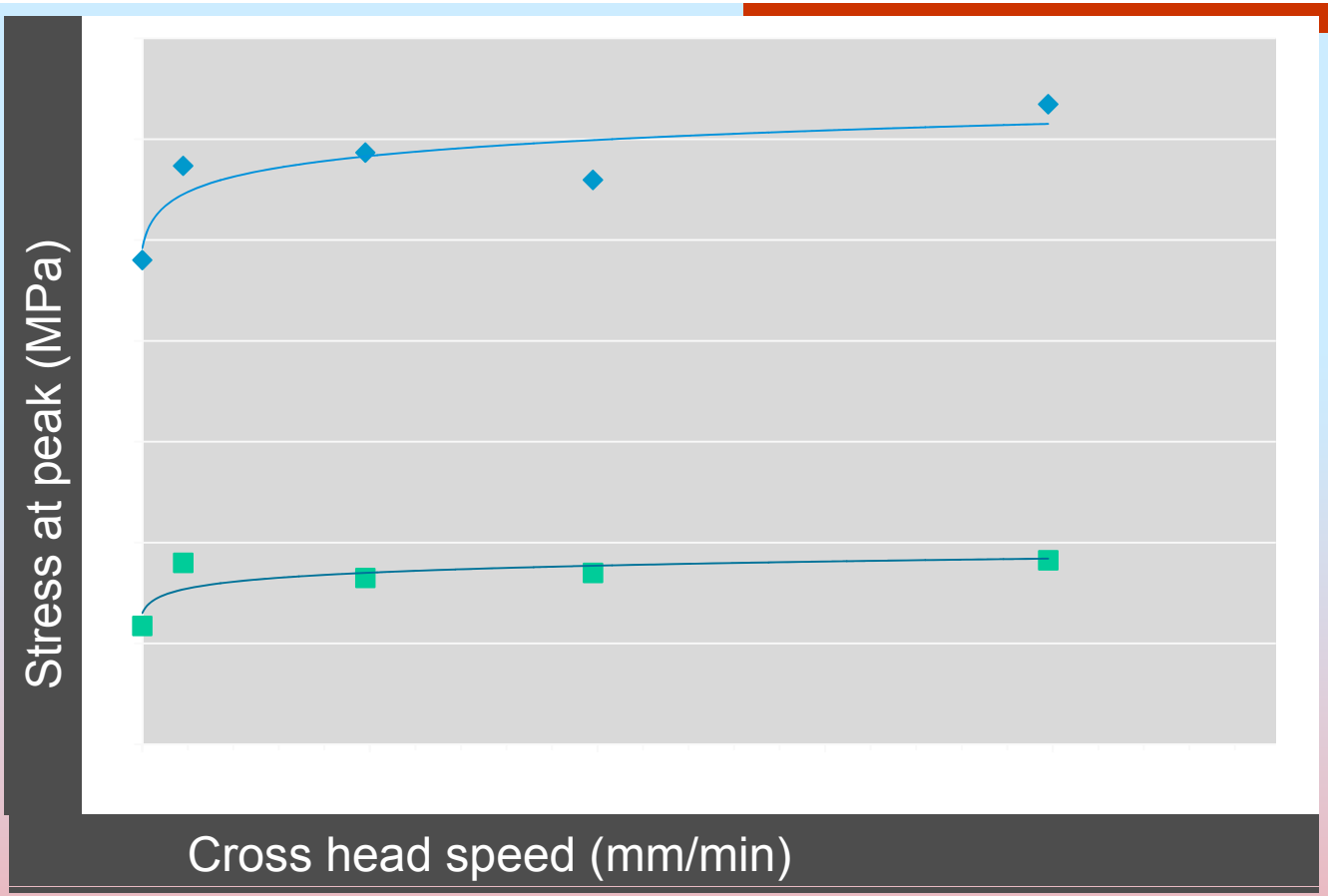
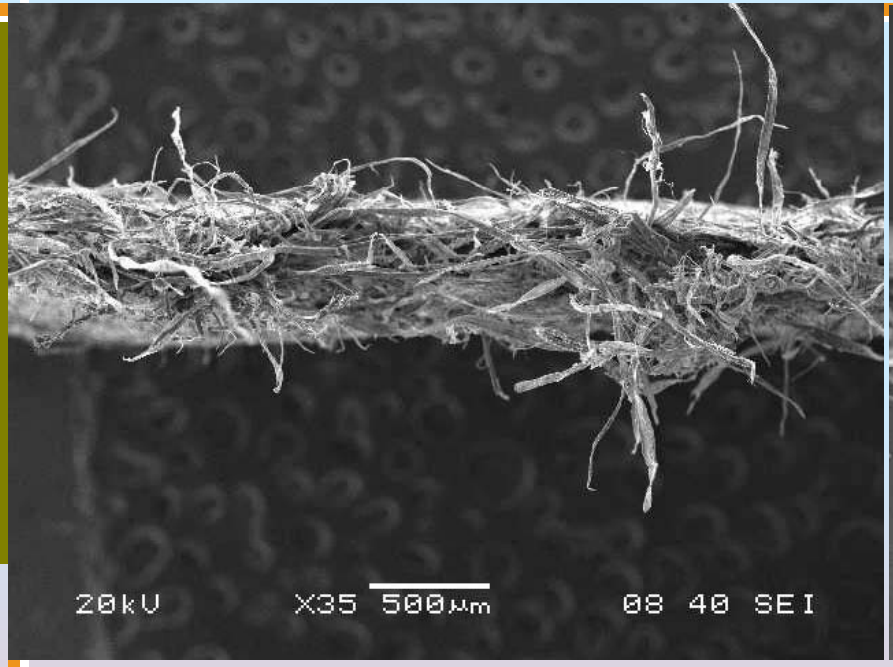


Comparison of Max Load to fracture and Tensile strength of unbleached Kraft paper single strip, Fiber free laminate and 0.05 g Jute Composite

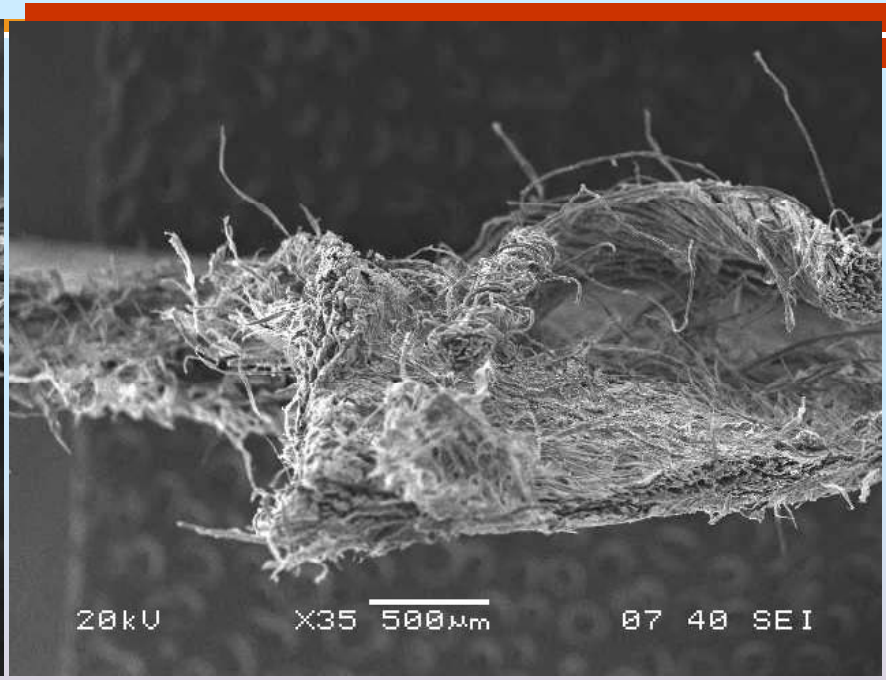

50
40
30
20
10
0
Tensile Strenth, MPa
PE, Mpa
PP, Mpa
PC,Mpa
Tensile strenth of some packaging materials



Effects of cross head velocity and aging on strength of composite (Natural aging for 7 days aging at 30℃ and 98% humidity)



(a)



(b)

SEM photograph of fractured cotton fiber reinforce laminated composite (a) As received (b) Natural aged

Conclusions

- The fiber free laminates exhibited a few fold increase in load carrying capacity, tensile strength and fracture energy relative to single paper strip.

- Significant enhancement in load carrying capacity, tensile strength and fracture energy have been noticed on introduction of fiber/ fabric as reinforcement.

- As expected the humid environmental exposure of composite resulted a loss of strength.