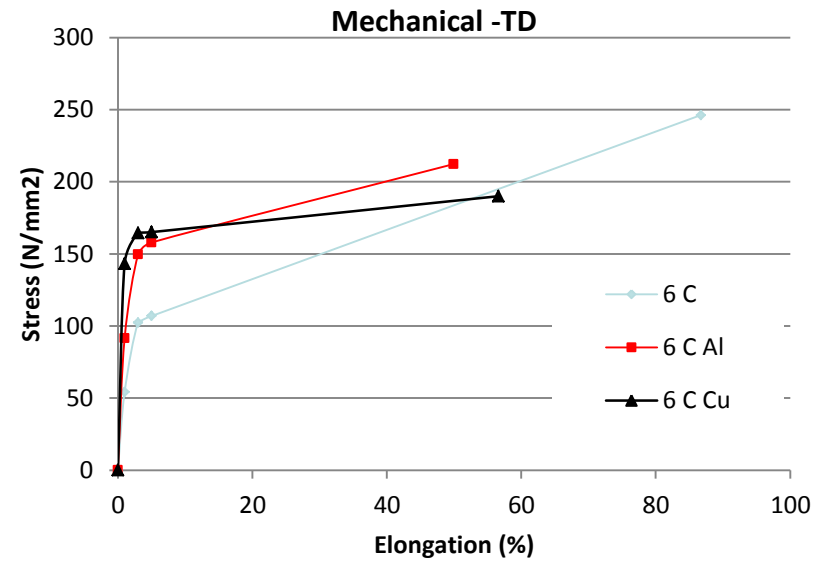
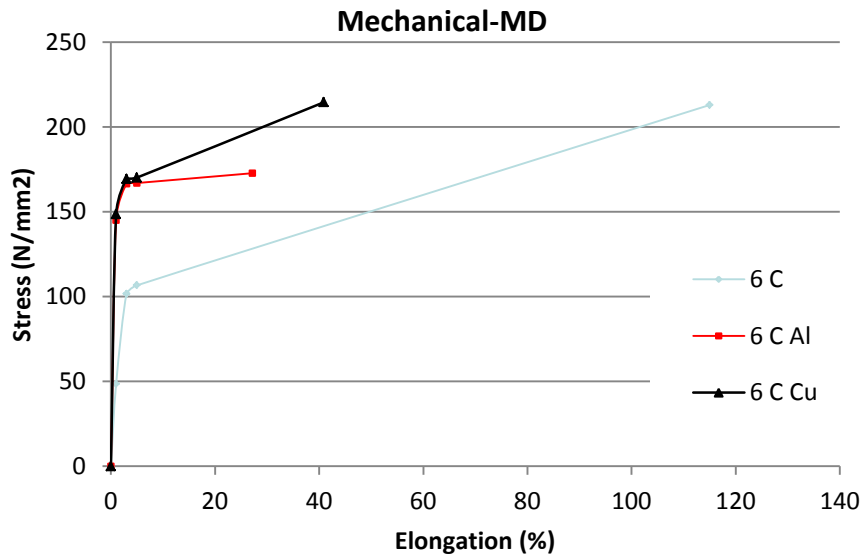


Properties of Thin metallized films

- Thin Al and Cu metallized films provided by SOTERIA (under NDA).
- Polyester Mylar[®] 6 C metallized by Applied Materials.
- Comparison of Properties of metallized film compared to non –metallized :
 - Thermal properties : Melting temperature (DSC)
 - Shrinkage Properties : Thermo-mechanical analysis (TMA) and Shrinkage
 - Surface Properties and Metal thickness
 - Mechanical Properties (Instron)

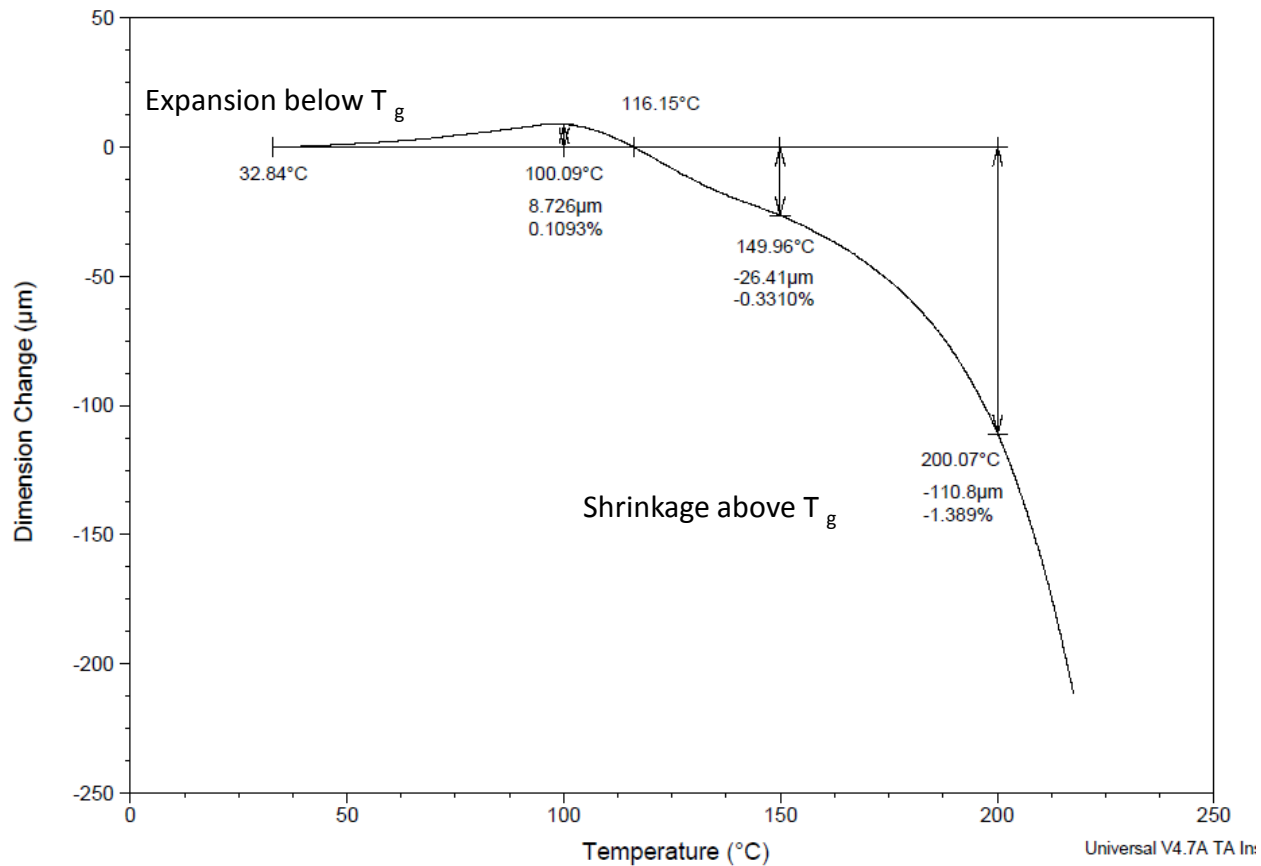
Mechanical Properties



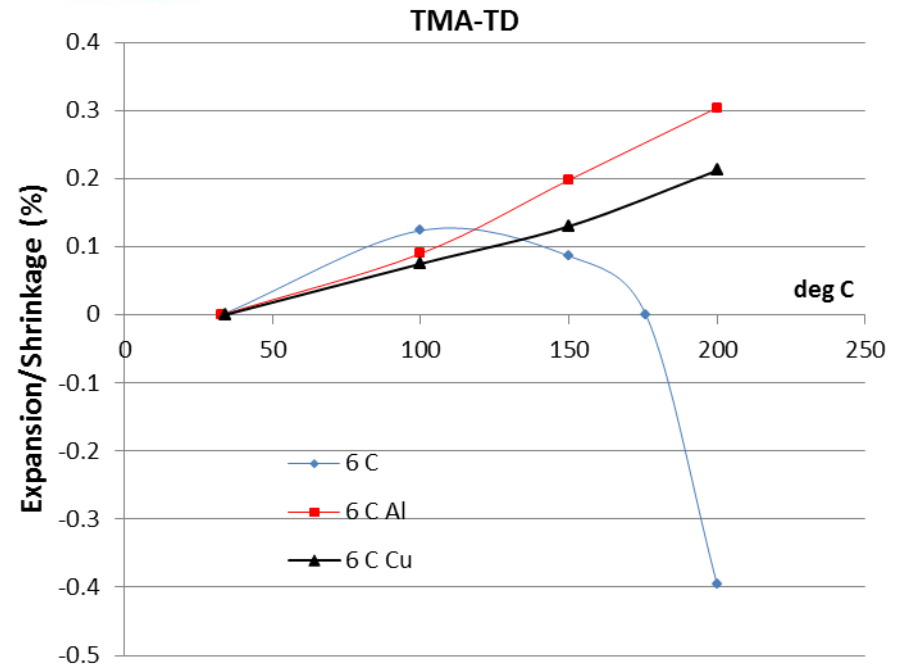
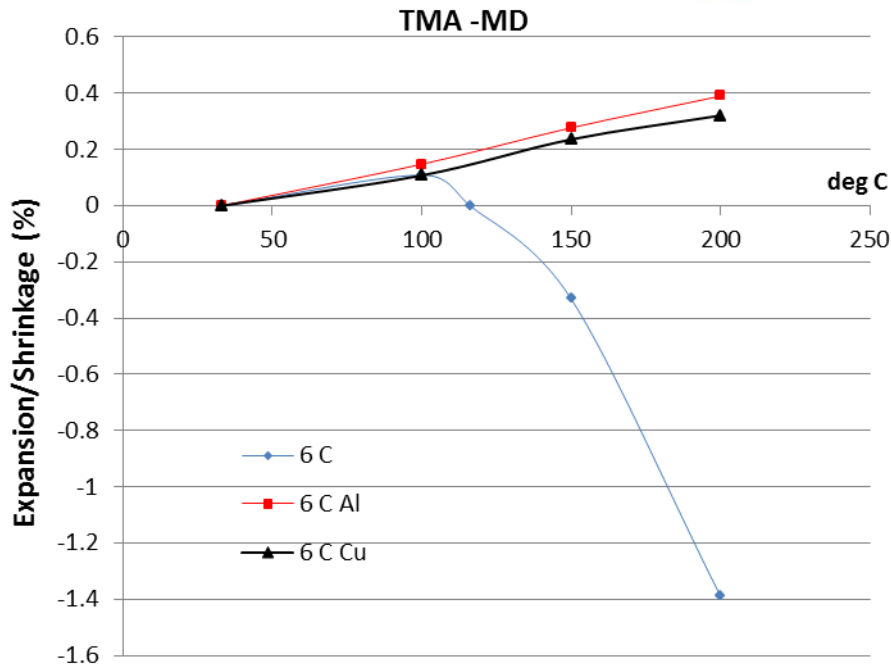
- Mechanical properties of metallized PET/Cu film show higher modulus and tensile but lower elongations than PET. Elongations are superior to Foils (< 5%) and improved handling of metallized film as current collector can be expected.

Thermal Mechanical Analysis (TMA)

- Thermal Mechanical analysis (TMA) indicates the expansion or shrinkage at constant stress in function of temperature – Typical Mylar 6 C – MD.



Thermal Mechanical Analysis (TMA) – Metallized films



- The metallized films behave like metal and show expansion in function of temperature.

Coeff. Expansion (ppm/deg C)

	PET/Al	PET/Cu
MD	23	19
TD	18	12

Shrinkage

- Shrinkage of films and metallized Cu films (150 and 200 ° C , 30 min)
- Metallized Cu film shows low shrinkage , independent of temperature.

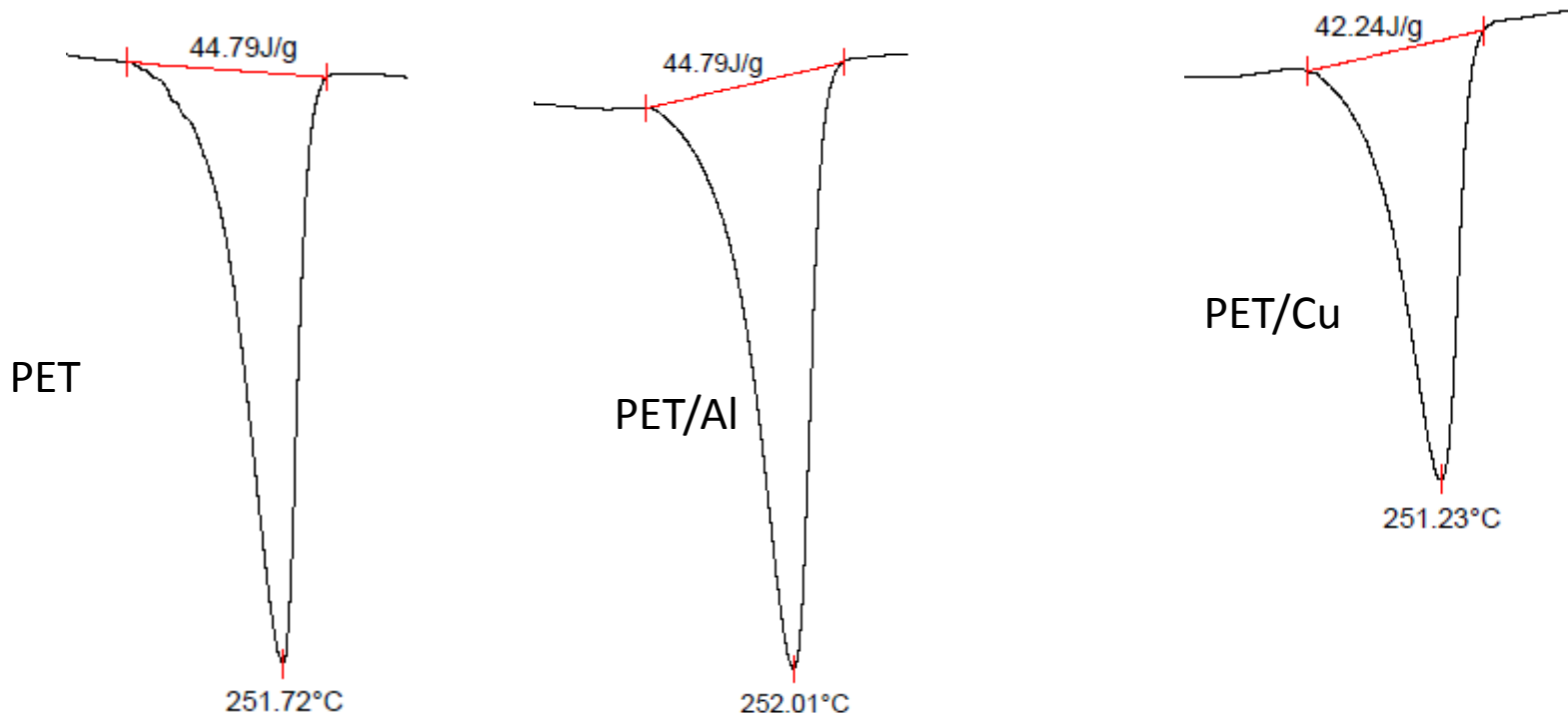
Dimstabs 6C5 & 6 um SOTERIA Cu

30min.	6C5	MD	TD
	150°	1.6	1.4
	200°	6.4	4.6

30 min.	6u Cu	MD	TD
	150°	0.4	0.4
	200°	0.4	0.4

DSC Melting Temperatures

- Melting point by DSC method – Metal dissolved in H NO3 15% @3 hrs.
- No change in crystalline structure by metal deposition process

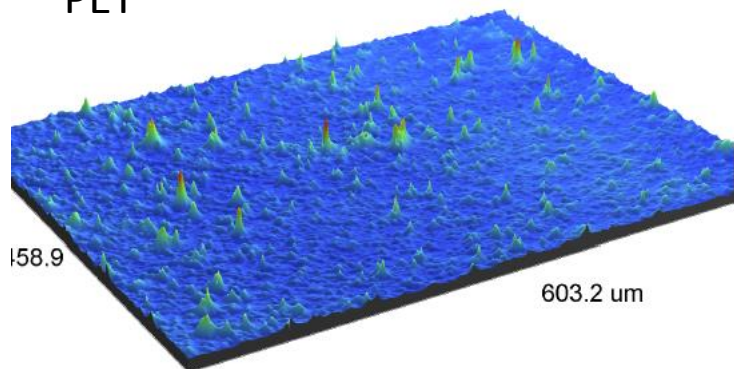


Surface Properties

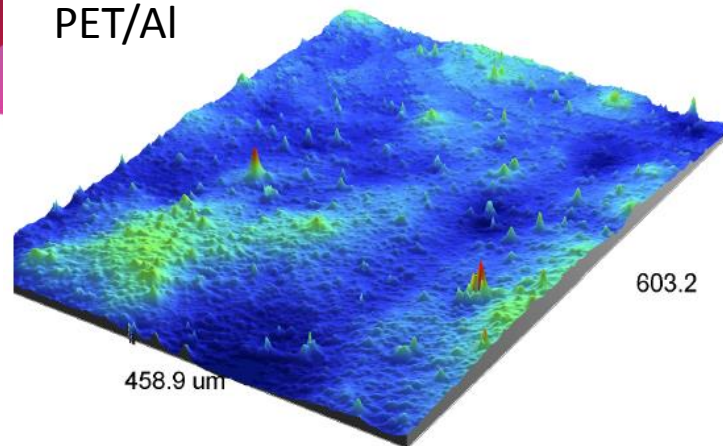
- Surface Properties measured by Optical (Veeco) and Contact method (Talysurf)
 - Veeco surface 0.5 x 0.6 mm
 - Talysurf : linear 2 mm

Surface Properties – Optical Veeco

PET

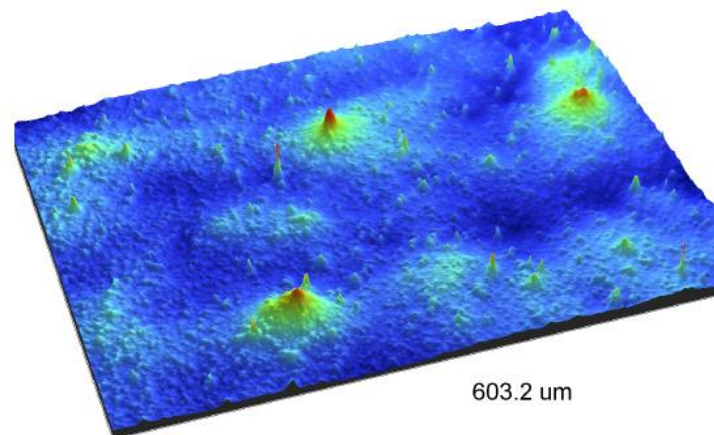


PET/Al



Same scale)

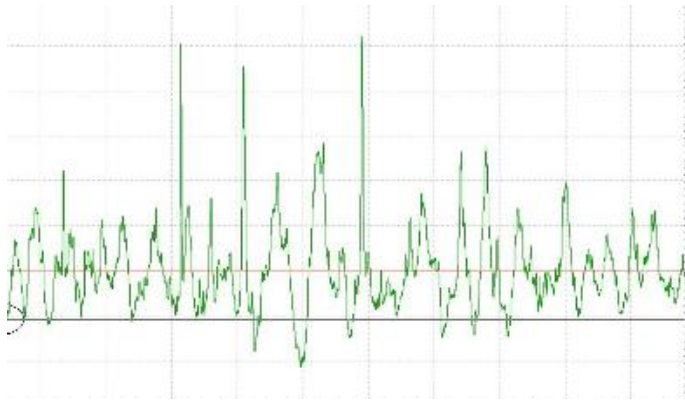
PET/Cu



- Surface Properties measured by Optical (Veeco) :
- Metallized Films show “unflatter” surface and reduced peaks related to fillers (PET/Al and PET/Cu)

Surface Properties – Optical Veeco

PET

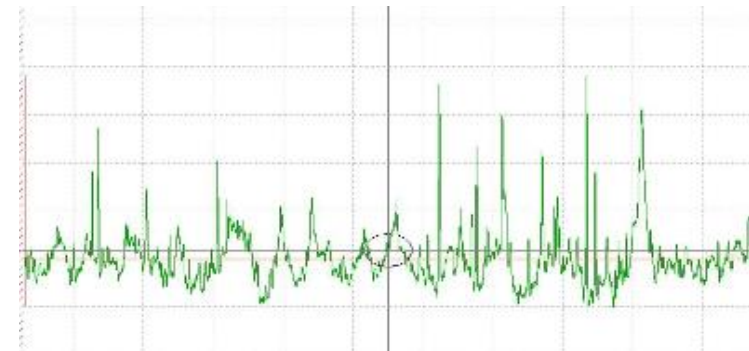


(Similar scale)



PET/Al

PET/Cu



- Surface Properties measured by Talysurf (Veeco) :
- Metallized Films show “unflatter” surface and reduced peaks related to fillers (covered by metal) on PET/Al.

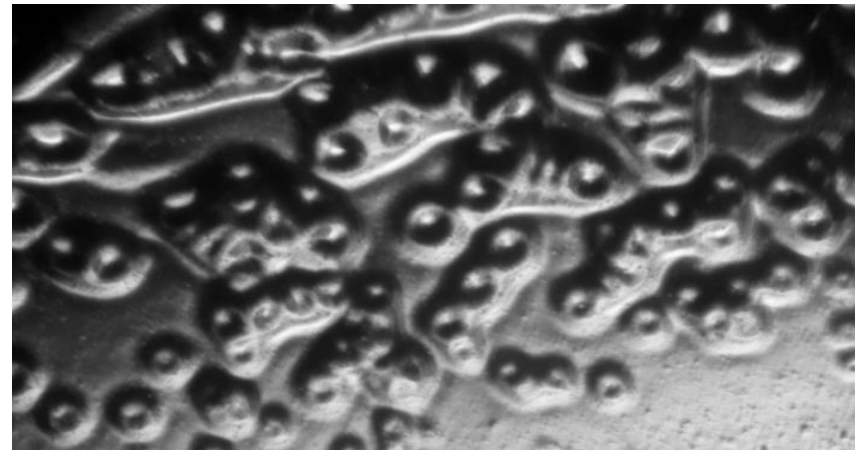
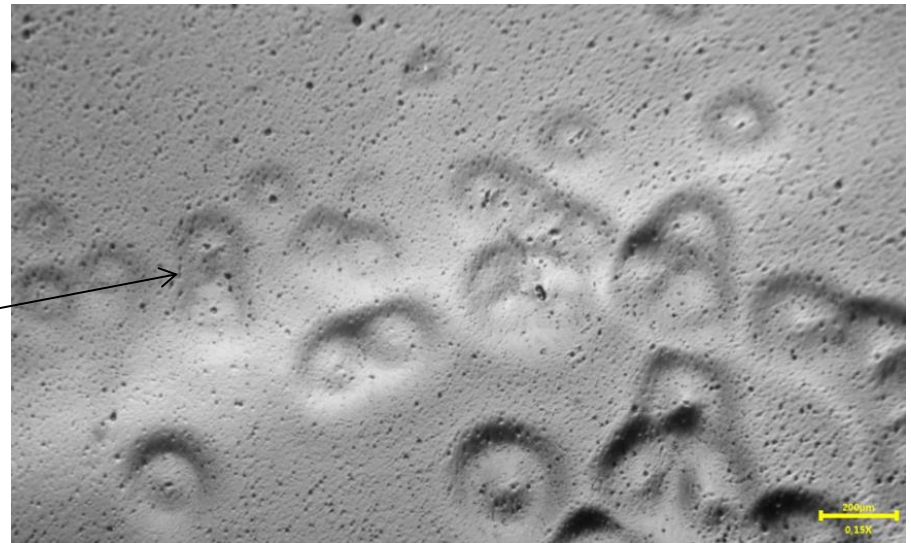
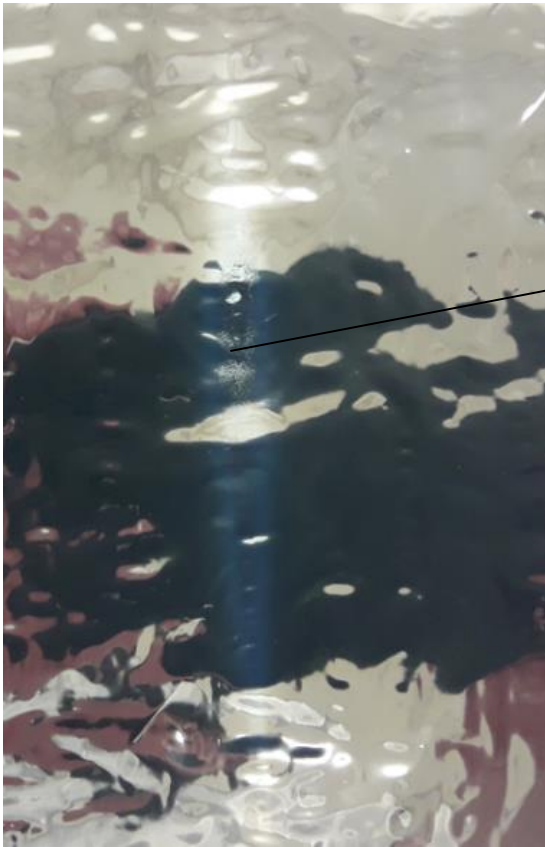
Metal Thickness

- Metal thickness was determined by the total weight of the metal on the film. Metal was dissolved from film by use of HNO_3 /15% solution.

Weight Determination			Al	Cu
Weight	before	(g)	0.0185	0.0233
Weight	after	(g)	0.0129	0.0159
Weight	metal	(g)	0.0056	0.0074
	density	(kg/m ³)	2600	8800
	Surface	(m ²)	0.001548	0.001848
	thickness/side	(m)	6.957E-07	2.2752E-07
		(μm)	0.70	0.23

Defects PET/Al

- Following defect was observed on PET/Al film , absence of metallization and probable heat related defect.



Conclusion – Metallized films as current collectors

- With the current achieved metal thickness (Al 0.7 μm /Cu 0.2 μm) , the metallized film show mechanical behavior as the polymeric film while the thermal properties are close to the metal foils (low shrinkage and expansion).
- It need to be confirmed what material properties will be achieved by using higher metal layers.

Contact

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