


<b>Application Development Center EMS-GRIVORY</b> <b>Answer to Technical Inquiry No.: 2016-0534</b>		
Author:	Gian Cadisch	Date: 19.01.2017
To:	Hiroaki Mifune	
Company:	Kyocera	
Country:	Japan (JP)	
Material:	Grilamid XT4516	
Application:	Sensor Camera Housing	

### **Problem Description / Target of the Customer:**

Sensor camera makers are showing interests in Grilamid XT4516 as the solution of kinds of problems they have with Reny

Kyocera gave us the conditions of the weatherability test and asked the implementation.

Application: Sensor Camera housing

Market Potential: 1,000 - 2,000 tons in 2020

<Test conditions>

Weatherability tests based on ISO 4892-2 method A

- Black Panel thermometer: Temperature: 83 ± 2
- Cycles of 18 minutes' pure water dispersion - 102 minutes' interval (Total 120 minutes for 1 cycle)

Repeat this condition for 1000 hours

<Measures /Specimen / pieces>

Please measure each specimen at the point of the start and after 400, 700, 1000 hours (Total 4 points)

1. Observation of the appearance / t2mm x 100mm plates / 20 pieces (5 pcs x 4 points )

- Gloss
- E

2. Measurement of the properties / Specimens based on ISO standard

- Tensile modulus / 40 pieces (10 pcs x 4 points )
- Tensile strength / Above
- Elongation / Above
- Notched charpy impact strength / 40 pieces (10 pcs x 4 points )
- Unnotched charpy impact strength / 40 pieces (10 pcs x 4 points )

<Materials>

- Grilamid XT4516
- Grilamid XT4516 + XE3680 (UVMB blended)
- Reny 1027

\*The specimens of each material are going to be prepared by ECJP team.

\*Please send back the tested specimens to Hiroaki Mifune of ECJP.

\*Test conditions are already confirmed with Herr Geli Soler of ECCH.

### Result / Solution / Proposal:

Weatherability test according to ISO 4892-2 Method A were performed and afterwards mechanical and optical performance tested.

To evaluate mechanical properties tensile test according to ISO 527, impact and notched impact test according to ISO 179.

It was found that Weatherability test has no significant influence on mechanical properties on each type of the tested materials.

		Tensile Modulus [MPa]		Tensile Strength [MPa]		Elongation at Break [%]	
		Value	Std dev	Value	Std dev	Value	Std dev
A) Grilamid XT 4516	Original	13000	80	151.2	0.2	2.5	0
A) Grilamid XT 4516	400h	12900	60	151.3	0.3	2.4	0.1
A) Grilamid XT 4516	700h	13100	80	151.9	2.2	2.4	0.2
A) Grilamid XT 4516	1000h	12800	50	148.4	3	2.4	0.1
B) Grilamid XT 4516 + XE3680 (UVMB blended)	Original	12300	120	152.5	0.7	2.5	0.1
B) Grilamid XT 4516 + XE3680 (UVMB blended)	400h	12500	60	152.9	0.6	2.6	0.1
B) Grilamid XT 4516 + XE3680 (UVMB blended)	700h	12400	50	152.7	1.6	2.4	0.3
B) Grilamid XT 4516 + XE3680 (UVMB blended)	1000h	12300	40	150.8	0.3	2.5	0.1
C) Reny 1027	Original	18000	830	185.3	21.9	1.3	0.2
C) Reny 1027	400h	18600	100	195.5	7.4	1.4	0.1
C) Reny 1027	700h	18800	170	196.3	6.8	1.4	0.1
C) Reny 1027	1000h	17900	560	190.5	17.2	1.4	0.2

Table 1: Tensile Properties after weathering

		Notched Impact Strength [kJ/m²]		Impact Strength [kJ/m²]	
		Value	Std dev	Value	Std dev
A) Grilamid XT4516	Original	17.8	0.6	61.6	5.3
A) Grilamid XT4516	400h	18.2	0.6	58.8	7.8
A) Grilamid XT4516	700h	17.5	0.6	58.4	4.3
A) Grilamid XT4516	1000h	17.3	0.7	60.2	5.2
B) Grilamid XT4516 + XE3680 (UVMB blended)	Original	17.5	0.7	66.6	2.9
B) Grilamid XT4516 + XE3680 (UVMB blended)	400h	17.4	1.5	59.8	2.1
B) Grilamid XT4516 + XE3680 (UVMB blended)	700h	18.3	1	61.6	8.2
B) Grilamid XT4516 + XE3680 (UVMB blended)	1000h	17.4	1	59.3	3.8
C) Reny 1027	Original	10.4	0.7	32.5	4.4
C) Reny 1027	400h	10.5	1	29.2	6.5
C) Reny 1027	700h	10.2	0.3	35.2	3
C) Reny 1027	1000h	11	1.2	31.1	8.3

Table 2: Charpy impact (notched and unnotched) after weathering

Regarding optical properties such as Gloss at 60° and Colour Difference (Table 3) no significant differences between the materials are detected.

		Gloss 60°	Colour Difference			
			dE	dL	da	db
A) Grilamid XT4516	Original	70				
A) Grilamid XT4516	400h	10	7.4	7.3	0.1	0.9
A) Grilamid XT4516	700h	8	7.1	7	0.2	1.4
A) Grilamid XT4516	1000h	6	9.8	9.7	0.1	1.5
B) Grilamid XT4516 + XE3680 (UVMB blended)	Original	79				
B) Grilamid XT4516 + XE3680 (UVMB blended)	400h	21	8.8	8.8	0.9	0.1
B) Grilamid XT4516 + XE3680 (UVMB blended)	700h	12	10.2	10	0.6	1.4
B) Grilamid XT4516 + XE3680 (UVMB blended)	1000h	6	13.4	13	0.5	1.4
C) Reny 1027	Original	75				
C) Reny 1027	400h	34	5.4	5.2	-1.5	-0.8
C) Reny 1027	700h	18	9.5	9.4	-0.1	1.9
C) Reny 1027	1000h	10	8.1	7.6	-0.9	2.5

**Table 3: Gloss and Colour Difference measured after weathering**

By eye Material B (Grilamid XT4516 + XE3680 (UVMB blended)) shows the smallest difference to the original sample.

Therefore pattern cards of the weathered samples are sent to Mr. Hiroaki Mifune for further evaluation by eye.