Compatibilizer UMEX

Umex is acid-modified polypropylene and improves dispersibility of pigments and fillers in polyolefin because of its high degree of modification and the low melt viscosity.

<Features>

✓ Filler dispersibility in polyolefin with low dosage.
✓ Improvement in Molding Processability.
✓ Heat resistance equivalent to polypropylene.

<Applications>

Glass fiber Dispersibility

Air conditioner cover

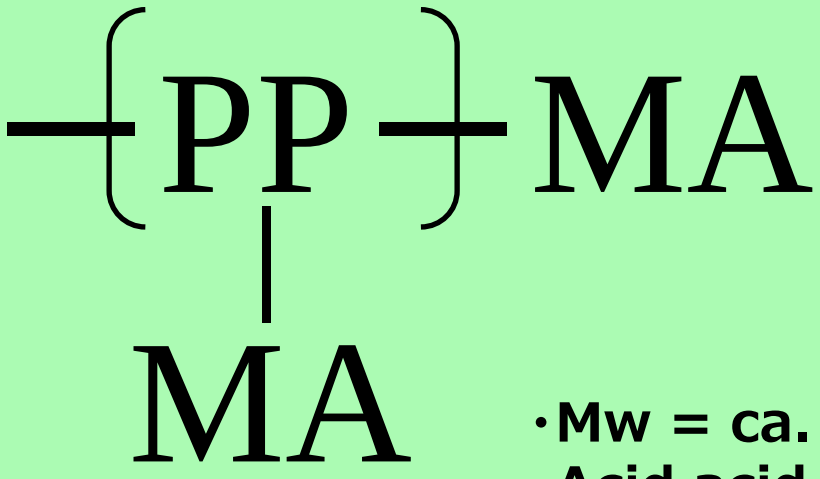
Plastic pallet

Wood flour Dispersibility

Wood plastic

UMEX products are a series of maleic-acid modified low-molecular weight polyolefins. These products have very high acid values,resulting in outstanding effectiveness at low dosage.

Structure of UMEX



- Mw = ca. 9,000 ~ 70,000
- Acid acid valuealue = ca. 3 ~ 50

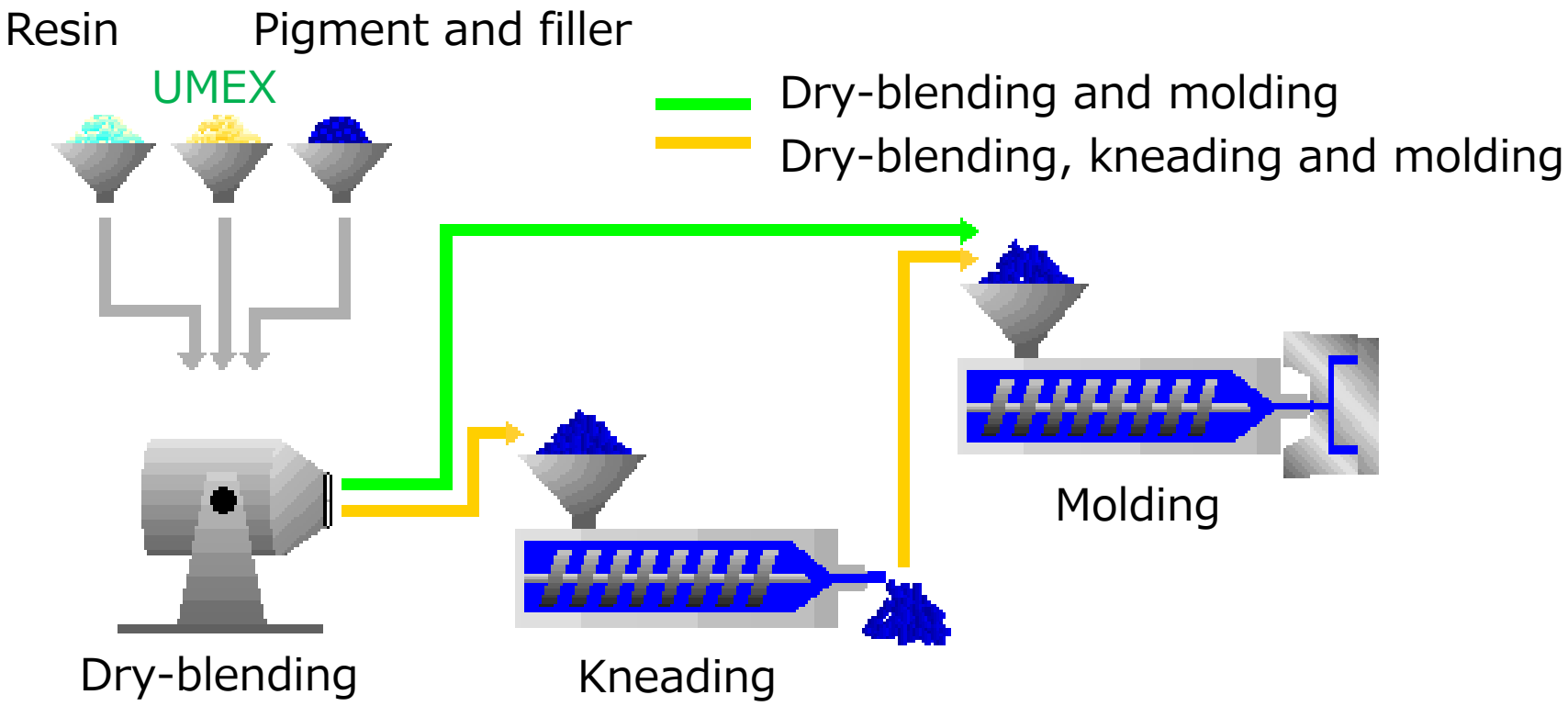
Polypropylene Segment

- Compatibility with polyolefin

Maleic anhydride Part

- Reactivity
- Dispersibility of fillers and pigments
- Adhesion properties

UMEX can be dry blended along with filler, pigment and resin.

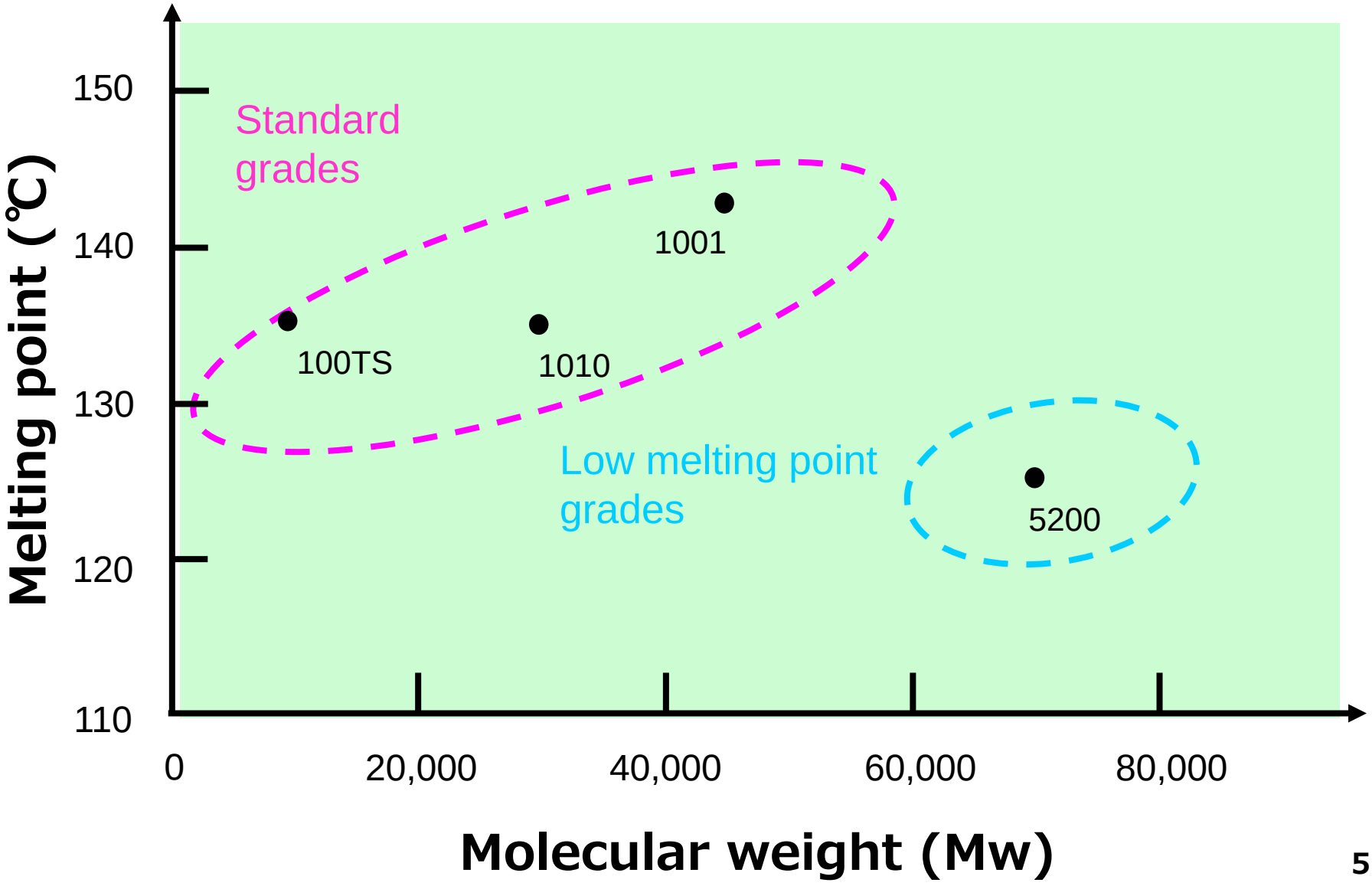


UMEX Grades

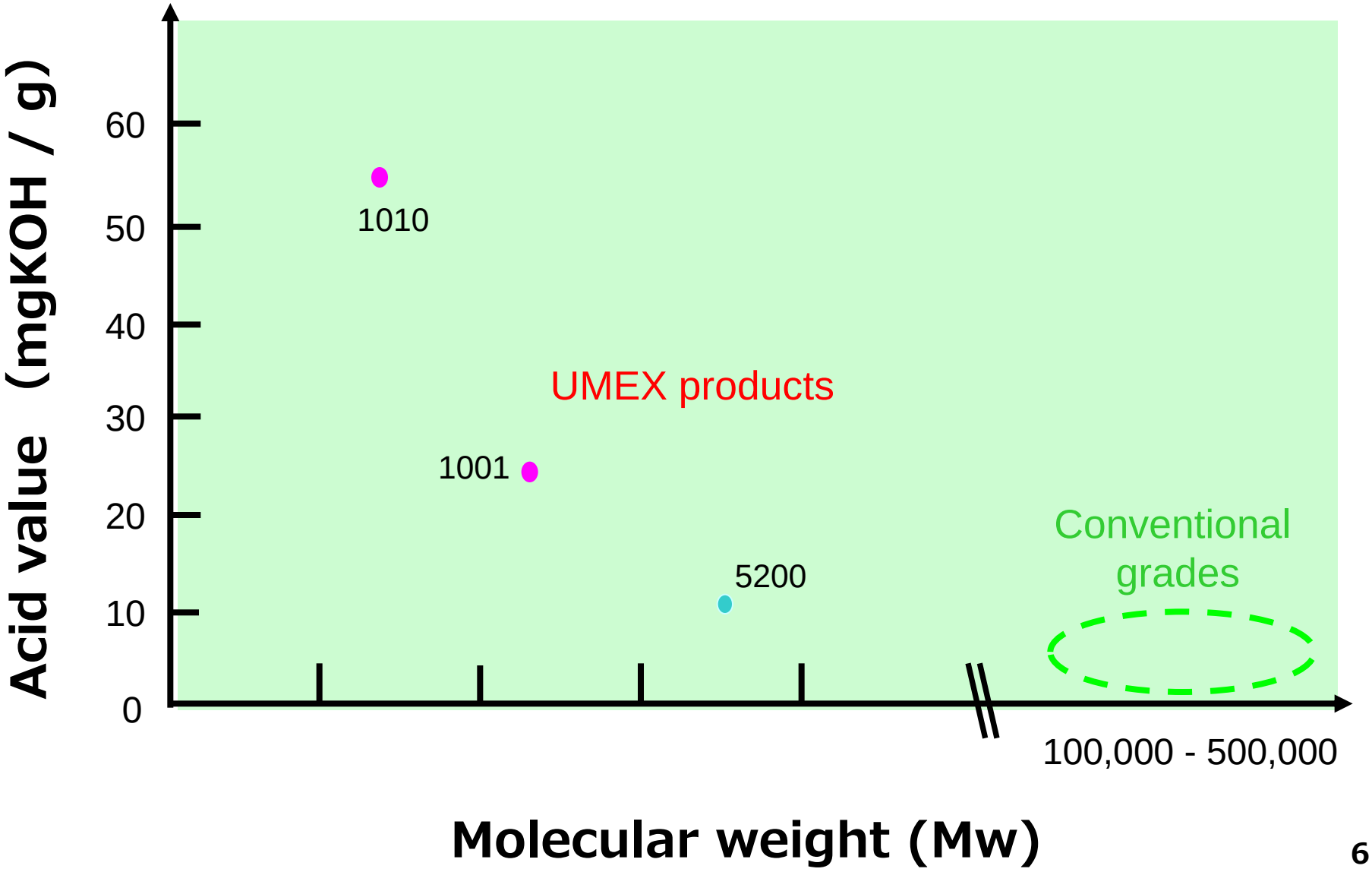
Grades	Appearance	Melting point (℃)	Melt viscosity (160℃) (mPa･s)	Acid value (mgKOH/g)	Molecular weight	Features
UMEX 1001	Yellow granule	142	15,000	26	45,000	Standard
UMEX 1010	Yellow granule	135	6,000	52	30,000	
UMEX 100TS	Pale yellow powder	136	120	3.5	9,000	
UMEX 5200	Yellow granule	124	20,000	11	70,000	Low melting point

Melting point ： DSC method, Acid value : ASTM D1386
Molecular weight : Gel permeation chromatography (GPC) using polystyrene standards.

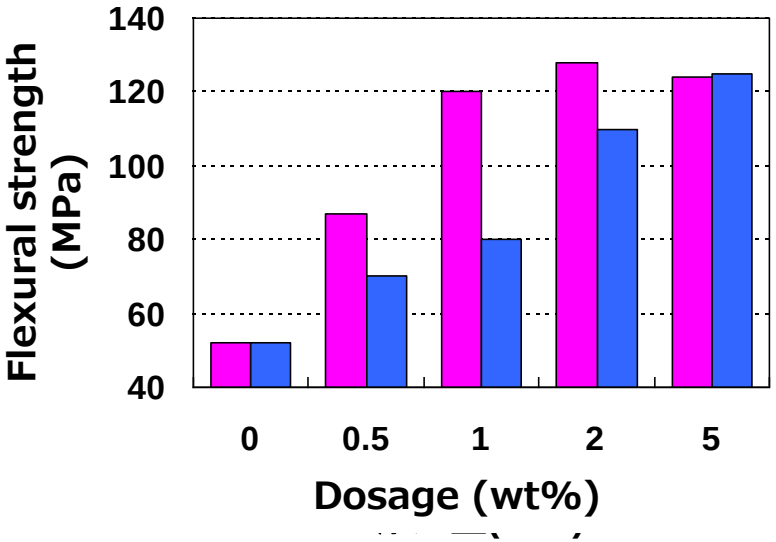
Properties of UMEX products



Properties of UMEX products



Exp. 1 Glass Fiber Dispersion for Polypropylene



Addition of a small percentage of UMEX (0.5-5wt%) results in a increase in flexural strength and other physical properties of glass fiber reinforced plastic (GFRP).

- UMEX 1001 added
- Competing grade added (High Mw, low acid value type)

Mechanical properties		UMEX 1001 (1wt% added)	Competing grade (1wt% added)	Blank
Flexural strength	(MPa)	120	80	50
Tensile strength	(MPa)	72	70	27
Izot impact strength-notched	(kJ/m^2)	11	8	9

Materials

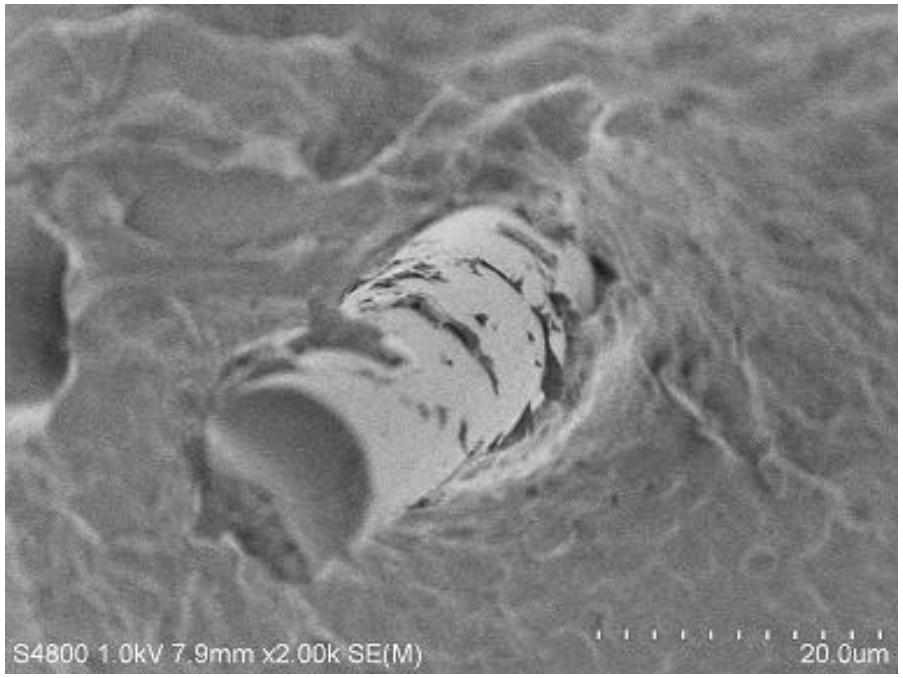
Polypropylene(70wt%), glass fiber* (30wt%) and UMEX were kneaded using a twin screw extruder at 220℃ andthen injection molded. (Nozzle temperature : 220℃, Mold temperature : 50℃)

*Glass fiber : Chopped strand (Fiber length = 3mm, Fiber diameter = 13μm)

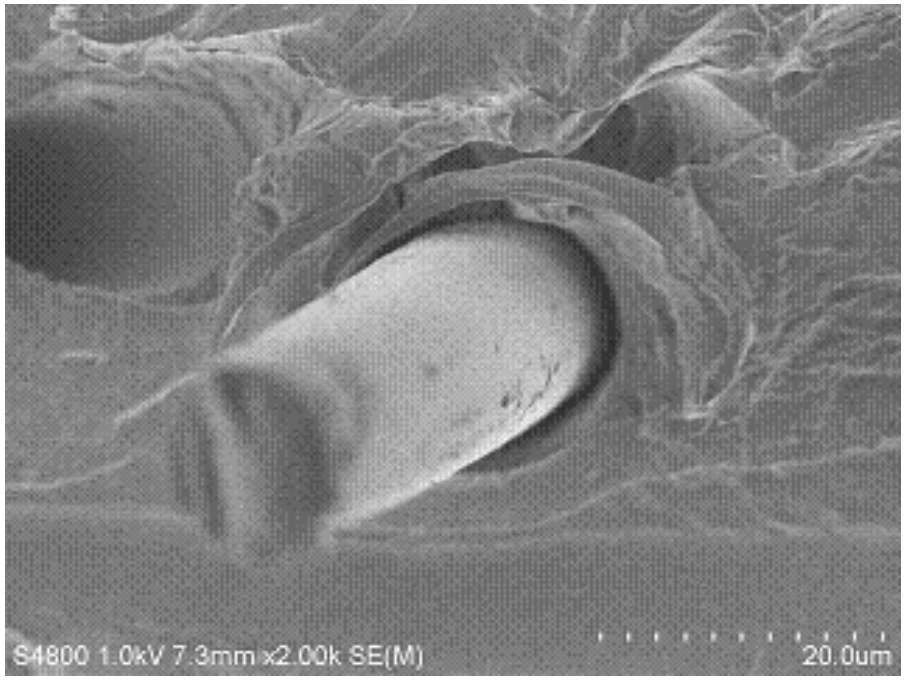
Test methods

Flexural test : ASTM D790, Tensile test : ASTM D638, Izot impact strength : ASTM D256

Exp. 1 Glass Fiber Dispersion for Polypropylene (Glass Fiber Reinforced Polypropylene)



UMEX 1001 (1wt%) added

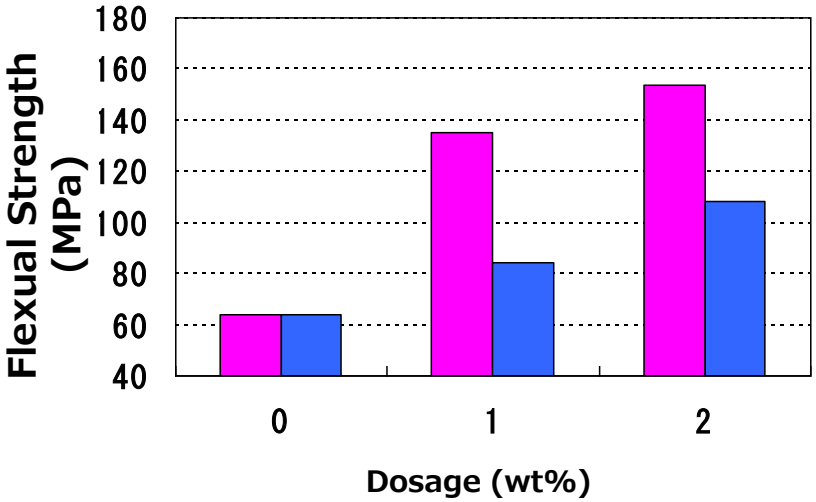


Additive - free

SEM images of the fractured cross section after izod testing.

Adhesion of glass fiber to polypropylene is improved.

Exp. 2 Carbon Fiber Dispersion for Polypropylene (Carbon Fiber Reinforced Polypropylene)



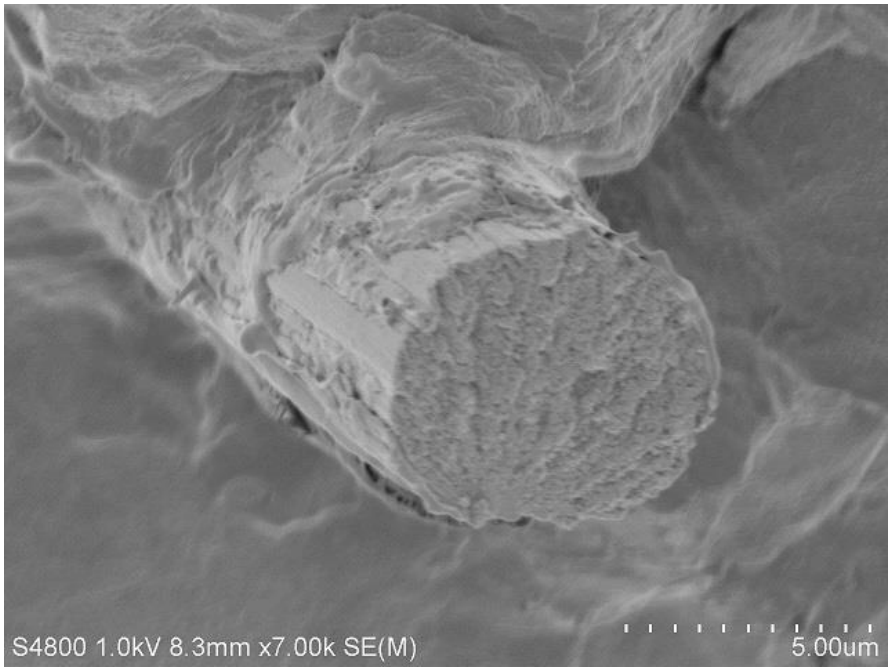
Addition of a small percentage of UMEX (1-2wt%)results in a increase in flexural strength and other physical properties of carbon fiber reinforced thermal plastic (CFRTP).

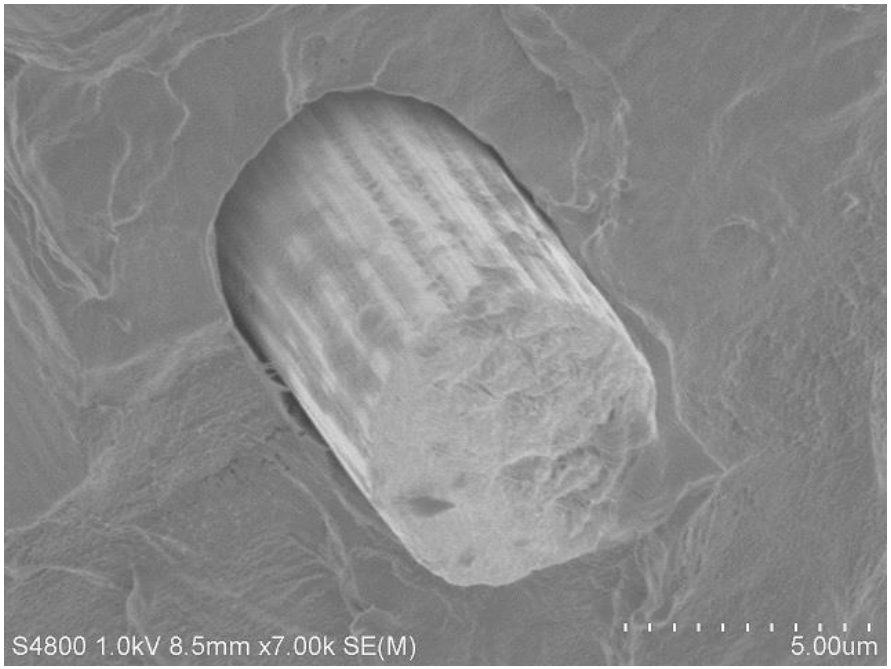
- UMEX 1001 added
- Competing grade* added

Mechanical properties		UMEX 1001 1wt% added	Competing grade* 1wt% added	Control
Flexural strength	(MPa)	135	84	64
Tensile strength	(MPa)	97	57	43
Deflection temperature under load	(℃)	145	136	115

Materials
Polypropylene(70wt%), carbon fiber**(30wt%) and UMEX were kneaded using a twin screw extruder at 250℃ and then injection molded. (Nozzle temperature : 250℃, Mold temperature : 50℃)
*Competing grade : High Mw, low acid value type
**Carbon fiber : PAN type chopped fiber (Fiber length = 6mm)
Test methods
Flexural test : ASTM D790, Tensile test : ASTM D638, Deflection temperature under load : ASTM D648(1.8MPa)

Exp. 2 Carbon Fiber Dispersion for Polypropylene (Carbon Fiber Reinforced Polypropylene)



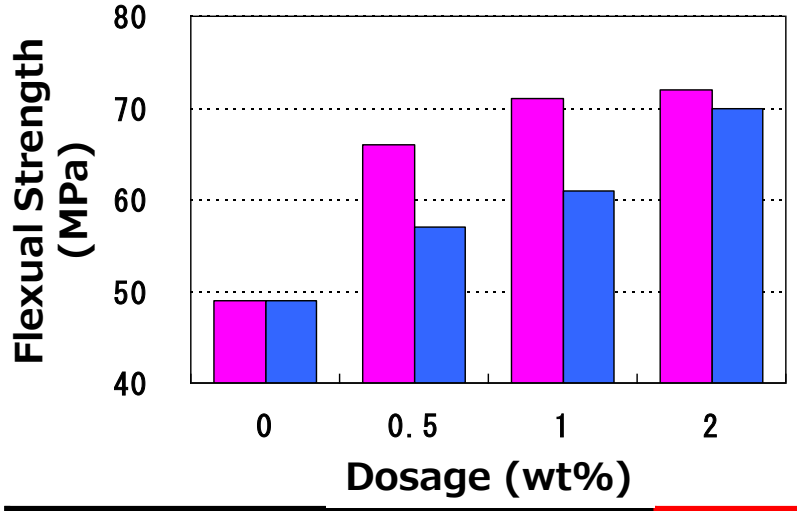


UMEX 1001 (1wt%) added **Additive-free**

SEM images of the fractured cross section after izod testing.

UMEX can help disperse carbon fiber into the base polypropylene.

Exp. 3 Wood Flour Dispersion for Polypropylene (Wood Plastic Composites Based on Polypropylene)



Addition of a small percentage of UMEX (0.5-2wt%) results in a increase in flexural strength and other physical properties of wood plastic composites (WPC).

- UMEX 1010 added
- Competing grade* added Materials

Mechanical properties	UMEX 1010 1wt% added	Competing grade* 1wt% added	Control
Flexural strength (MPa)	71	61	49
Tensile strength (MPa)	47	38	28
Tensile modulus (MPa)	550	540	470

Materials

Wood flour** (50wt%), polypropylene(50wt%) and UMEX were kneaded using a twin screw extruder at 200℃ and then injection molded. (Nozzle temperature: 200 ℃, Mold temperature: 50 ℃)

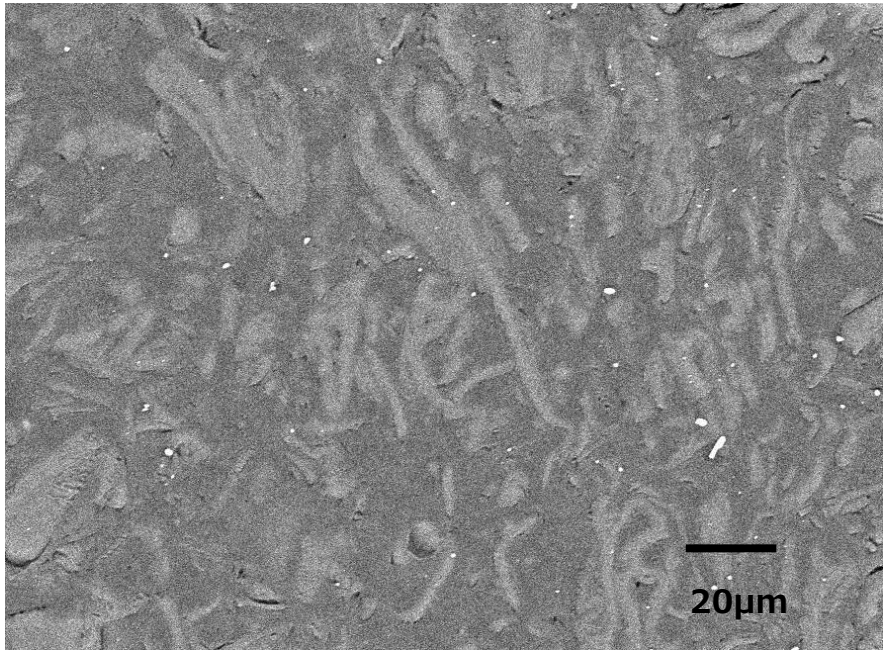
*Competing grade : High Mw, low acid value type

**Wood flour : 180μm pass, dried at 80℃ for 2hours.

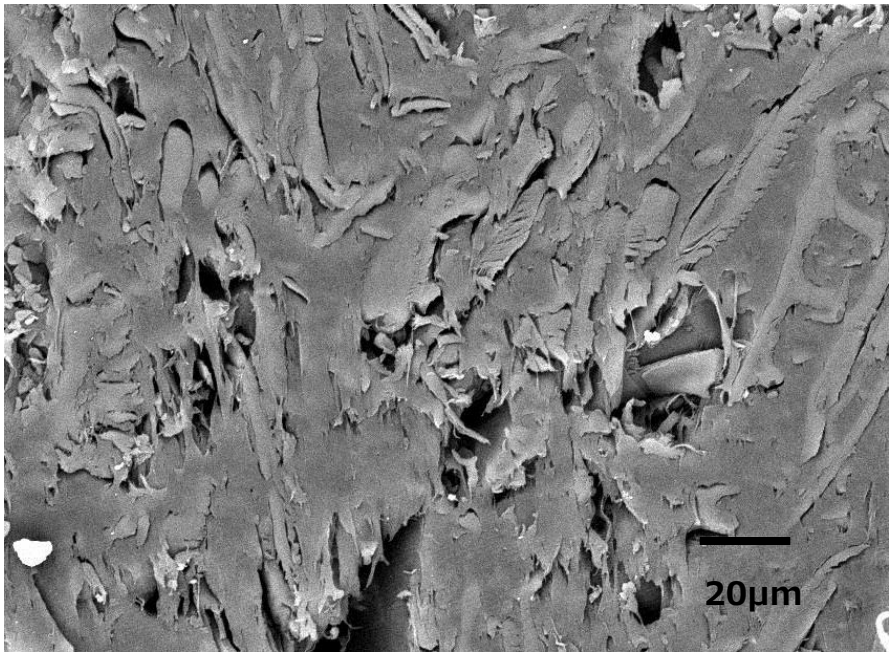
Test methods

Flexural test : ASTM D790, Tensile test : ASTM D638

Exp. 3 Wood Flour Dispersion for Polypropylene (Wood Plastic Composites Based on Polypropylene)



UMEX 1010 (1wt%) added

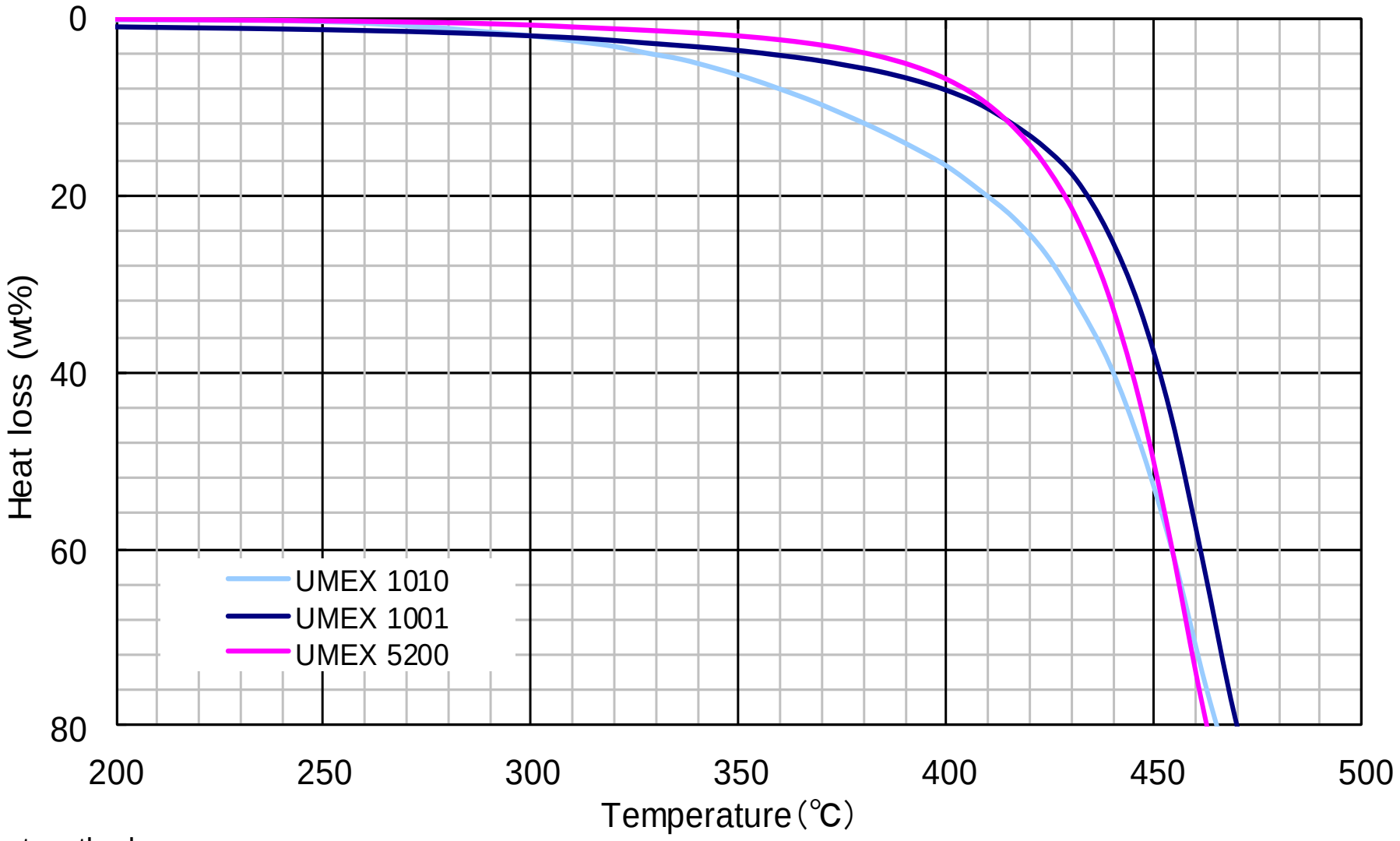


Additive-free

SEM images of the cross section.

UMEX can help disperse cellulose fibers into the base polypropylene.

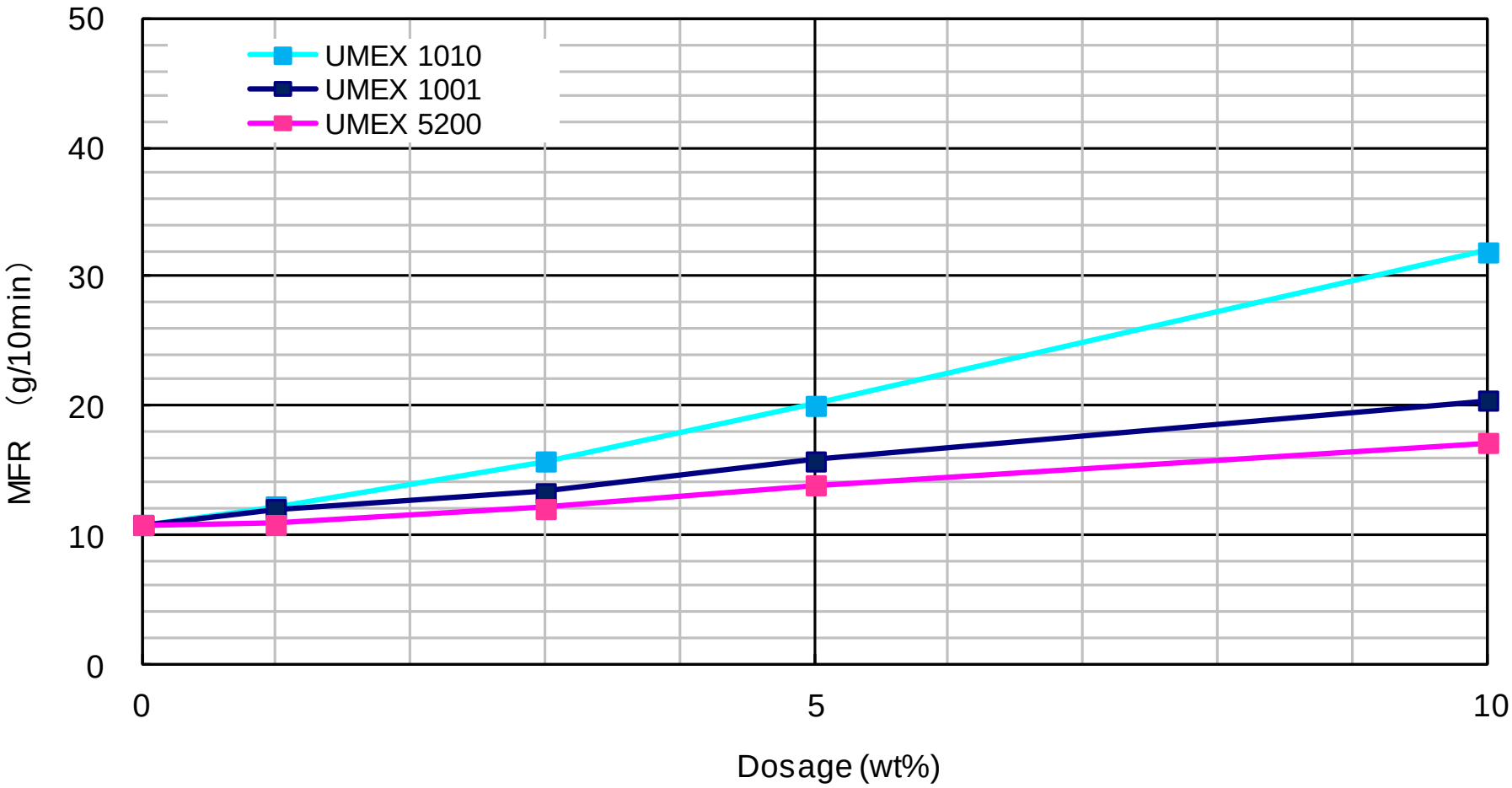
Effect on heat loss properties in N_2 gas



Test method

Heat rate : 10℃/min Ambience : N_2

Effect on MFR



Materials

UMEX and polypropylene* were kneaded using a twin screw extruder at 220℃.

*Polypropylene : MFR = 11, block PP

Test method

MFR : Measured at 230℃, 2.16kgf.

Resin Compatibility

Resin	Compatibility
LDPE	○
HDPE	○
PP	○
EVA	△
PVC	×
PS	×
6Ny	○
PC	△
PBT	△
m-PPE	×
PMMA	△
ABS	△

UMEX / Resin = 5 / 95

○ ・・・ Compatible　　△ ・・・ ×　Incompatible

Solvent Resistance

Solvent	Room temperature	Boiling point
Toluene	I	S
Xylene	I	S
n-Hexane	I	I
n-Heptane	I	I
Ethyl acetate	I	I
Butyl acetate	I	I
Methyl ethyl ketone	I	I
Methyl isobutyl ketone	I	I
ethanol	I	I
Isopropanol	I	I

UMEX / Solvent = 1 / 4 (wt / wt)
S : Soluble , I : Insoluble