

複合材界面特性評価装置 MODEL HM410

EVALUATION EQUIPMENT FOR INTERFACIAL PROPERTY OF COMPOSITE MATERIAL

マイクロドロプレット法を用いた繊維と樹脂界面のせん断強度測定、接触角測定

MEASUREMENT OF FIBER/PLASTIC INTERFACIAL SHEAR STRENGTH AND CONTACT ANGLE USING MICRO-DROPLET METHOD



概要 SUMMARY

任意の温度環境下で極細単繊維に液状樹脂を付着させ、その形状を撮影し、画像から接触角を求めます。同時に同一サンプルを使って引抜試験を行い、その時の引抜荷重から、繊維と樹脂の界面せん断強度を求めます。

At first, make micro-droplet resin sample to mono-filament fiber.

And then the contact angle of the micro-droplet will be measured by the image processing system.

Also, the pull out process will be done at the same time using the same sample.

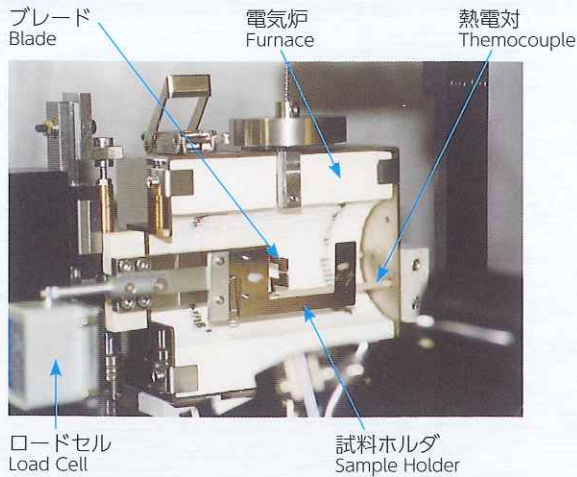
The interfacial shear strength between the fiber and the resin will be calculated by the load strength of the pull out process.

It is available to be done the above processes under any temperature and atmosphere.

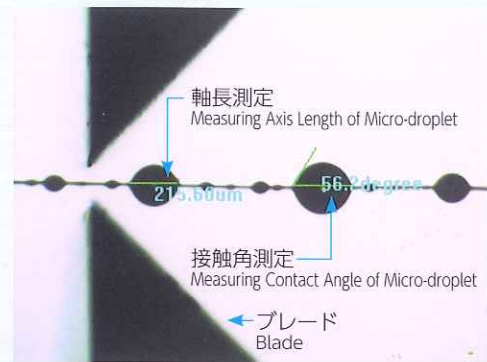
仕様 SPECIFICATION

繊維の種類 Kind of Fiber	: ガラス繊維、炭素繊維、有機繊維、 無機繊維 Glass Fiber, Carbon Fiber, Organic Fiber, Ceramic Fiber	測定項目 Measurable Item	: 界面せん断強度／接触角 Interfacial Shear Strength / Contact Angle
樹脂の種類 Kind of Matrix Resin	: 熱可塑性樹脂、熱硬化性樹脂 Thermal Plastic Resin, Thermal Hardening Resin	界面せん断強度 Interfacial Shear Strength	: データ処理により演算及び作表 Calculation in Date Processing and Making a Table of Interfacial Shear Strength
試験温度 Test Temperature	: RT~400°C RT~400°C	接触角 Contact Angle	: 画像処理ソフトにより求める Calculate by Image Processing System
温度設定 Temperature Setting	: 温度コントローラによる By Temperature Controller	顕微鏡倍率 Scaling Factor of Microscope	: ×4.5 (最大) ×4.5 (Max)
加熱炉 Furnace	: 抵抗式加熱炉、熱電対式测温 System by Thermocouple	試験雰囲気 Testing Atmosphere	: 大気中・窒素 Air or Nitrogen Gas
ロードセル (標準) Load Cell (Std)	: 0~5,000mN 0~5,000mN	外形寸法 Dimension	: 770W×600D×750H mm 770W X 600D X 750H mm
引抜速度 Pull Out Speed	: 標準 0.12mm/min 任意設定可 Std 0.12mm/min, Optional Speed Available	消費電力 Electric Power Consumption	: AC100V 1,000VA AC100V 1,000VA

測定ヘッド部 CLOSE UP PICTURE MEASURING HEAD



サンプル画像 SAMPLE PHOTO OF MEASURING PROCESS



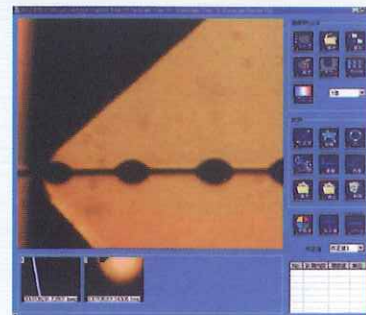
評価方法 EVALUATION METHOD

界面せん断強度 (τ)
Inter Facial Shear Strength (τ)

$$\tau = F / \pi dL$$

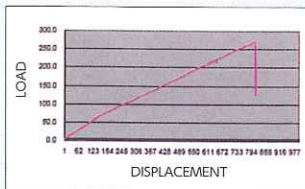
- F : 引抜最大荷重
Maximum Tencile Load
- d : 繊維径
Fiber Diameter
- L : マイクロドロプレット軸長
Axis Length Of Micro-Droplet

画像処理画面 SAMPLE SCREEN OF IMAGE PROCESSING



Picture Under Measuring

測定画面 SAMPLE SCREEN OF SHEAR STRENGTH MEASURING PROCESS

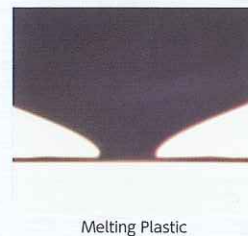


Graph of Load / Displacement

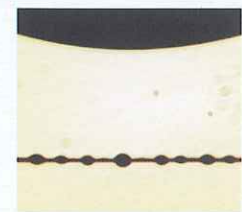
Count	TIME(sec)	F (mN)	PC-Time (sec)
789	49.3125	296.0	409.408
790	49.3375	295.0	409.506
791	49.4375	296.0	410.422
792	49.5	296.0	410.922
793	49.5625	297.0	411.422
794	49.625	297.0	411.937
795	49.6875	297.0	412.437
796	49.75	298.0	412.937
797	49.8125	299.0	413.437
798	49.875	270.0	413.953
799	49.9375	270.0	414.453
800	50	270.0	414.953
801	50.0625	270.0	415.469
802	50.125	271.0	415.969
803	50.1875	271.0	416.469

Table Of Measuring DATE

熱可塑性樹脂試料作成 MAKING PROCESS OF THERMALPLASTIC RESIN MICRO-DROPLET



Melting Plastic



Micro-droplet

種々材料の組合せによる実験例 EVALUATION TEST RESULTS OF VARIOUS COMBINATION OF FIBERS AND RESINS

繊維 (線径 μm) FIBER(dIA)	マトリックス MATRIX	処理温度-処理時間 TEST TEMP-TIME	雰囲気 ATMOSPHERE	せん断強度 (MPa) SHEAR STRENGTH (MPa)
GF (13.0)	PP	185°C	AIR	13.1
GF (13.0)	EP ^{※1}	175°C-1Hr	AIR	40.6
GF (13.0)	RBT	240°C	AIR	17.9
GF (11.0)	UP	80°C-4Hr	AIR	32.0
GF (10.0)	PC	270°C	N ₂	43.8
GF (10.0)	PA	290°C	N ₂	55.1
GF (11.0)	PE ^{※2}	140°C	AIR	8.1
CF (10.0)	Si	150°C-18Hr	AIR	12.2
CF (7.0)	PPS ^{※3}	280°C	N ₂	24.2
CF (7.0)	VE ^{※4}	130°C-5min	N ₂	26.5
CF (7.0)	PI	400°C	N ₂	56.6
CF (7.0)	EP	130°C-2Hr	AIR	27.1
ARAMID (10.0)	EP	150°C-6Hr	AIR	43.1
CERAMIC (10.0)	EP	130°C-2Hr	AIR	13.5
CF (7.0×7本)	CEMENT	20°C-300Hr	SATURATION VAPOR	9.1

※1 EPOXY ※2 POLYESTER ※3 POLY PHENYLESTER ※4 VINYL ESTER