PLAINTIFF'S EXHIBIT

UC-5353

BAKELITE®

PHENOLICS FOR COMPRESSION PLUNGER AND INJECTION MOLDING

UNION CARBIDE

PLASTICS FROM THE DISCOVERY COMPANY

PHENOLICS FOR COMPRESSION PLUNGER AND INJECTION MOLDING

BAKELITE®

...N, PLUNGER AND INJECTION MOLDING

					ELECTRICAL INSULATING			CHEMICAL RESISTANT
...MG-5120 ...ACK 25 (c)	BMG-5498 BLACK 25 (b)	BMM-7000 BLACK 25 DC BROWN 15	BMM-7002 BLACK 25 DC BROWN 15	BMMA-/333 BLACK 25 DC	BMG-0048 BLACK 25	BMG-0750 NATURAL (c)	BMG-5017 NATURAL	BMG-2156 BLACK 15 (a)
...Two-Step	Two-Step	Two-Step	Two-Step	Two-Step	One-Step	Two-Step	Two-Step	One-Step
...oodflour	Woodflour	Woodflour	Woodflour	Woodflour	Mineral	Mica	Mica	Woodflour
...tchboards	Appliance Parts	Gen. Purpose	Wiring Devices and Cases		Electrical Components	Electric Insulation	Automotive Ignition	Industrial Parts
1.34	1.42	1.36—1.39	1.35—1.39	1.38	1.70	1.68	1.84	1.45
2.8	2.4	2.4	2.5	2.0	2.2	2.4	2.4	2.4
0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.002	0.007
6—15	3—18	4—18	6—15	6—15	26	6—15	4—15	4—15
8,500	7,500	6,900	9,000	7,000	5,600	6,600	7,100	7,000
11,000	9,200	7,900	11,900	9,900	9,500	8,700	9,000	8,000
10	10	10	10	10	21	20	22	8.7
33,400	32,100	35,000	36,200	30,300	28,000	28,000	26,000	31,000
0.33	0.29	0.30	0.31	0.31	0.33	0.35	0.35	0.26
320	320	330	327	320	310	310	330	350
360	360	350	380	310	430	370	360	285
29	56	36	4	11	6,400	1,000	400	150
6.0	6.0	6.0	10.0	6.3	5.2	5.0	5.6	13.0
5.0	5.0	5.0	7.0	5.6	4.9	4.6	5.3	9.0
4.6	4.7	4.0	5.0	4.5	4.6	4.5	4.7	6.0
0.07	0.07	0.07	0.40	0.11	0.03	0.03	0.05	0.20
0.04	0.04	0.04	0.13	0.06	0.02	0.03	0.04	0.10
0.034	0.029	0.04	0.05	0.04	0.011	0.015	0.01	0.06
	0.4 —	0.7 —	0.6 —	0.5 —	0.02 —	0.03 —	0.05 —	0.3 0.9

			IMPROVED IMPACT						
...-5333 ...25 DC	BMGA-5867 BLACK 25	BMGF-8335 BLACK 35	BMG-2051 BLACK 35	BMG-2080 BLACK 25	BMG-2933 BLACK 15 (a)	BMG-5315 BLACK 25	BMG-5316 BLACK 25	BMG-5400 BLACK 15 (a)	BMMB-5715 BLACK 25
...-Step	Two-Step	Two-Step	One-Step	One-Step	One-Step	Two-Step	Two-Step	Two-Step	Two-Step
...eral	Mineral	Mineral	Flock	Flock	Flock	Flock	Flock	Flock	Flock
...ance & ...trical ...arts	Appliance Parts	Knobs & Handles	Electric Switches	Wet-Dry Applications	Wet-Dry Applications	Wet-Dry Applications	Wet-Dry Applications	Pump Impellers	Electric Switches
1.40	1.51	1.61	1.37	1.37	1.36	1.36	1.36	1.37	1.36
2.6	2.5	2.35	2.8	3.2	2.6	3.5	3.6	2.9	2.5
004	0.004	0.003	0.006	0.006	0.006	0.004	0.004	0.004	0.006
—15	9—21	6—15	6—15	9—18	6—18	6—18	9—18	6—15	6—12
.800	5,500	5,800	7,200	7,600	7,600	7,800	7,900	7,800	7,000
.500	8,000	8,000	10,200	10,200	9,000	10,300	10,100	10,300	9,500
12	12	14	9	7.5	8.8	9.8	10	9.8	10
.000		30,000	27,400	27,000	28,800	36,000	35,600	36,000	38,000
0.27	0.29	0.32	0.40	0.48	0.35	0.38	0.48	0.35	0.39
350	370	330	350	310	350	355	355	355	305
300	280	290	280	270	230	280	300	280	305
10	46	18	61	30	4.0	13	24	13	120
8.5	8.0	11.0	7.0	11.0	12.0	11.0	9.0	11.0	5.9
6.7	6.6	9.0	7.0	8.0	9.0	7.0	7.0	7.0	5.4
5	4.8	6.0	6.0	6.0	6.0	5.0	5.0	5.0	4.3
	0.14	0.17	0.10	0.20	0.27	0.20	0.12	0.20	0.069
0..	0.09	0.17	0.05	0.15	0.13	0.18	0.11	0.18	0.044
0.04	0.04	0.05	0.04	0.05	0.6	0.05	0.05	0.05	0.038
0.2	0.1	0.1	0.6	0.4 2.6	0.4 1.9	0.3 2.2	0.3 2.5	0.2	0.3

(a) Not recommended for electrical applications.
(b) BMM Granulation for automatic powder molding is also available.
(c) Approved under Mil-M-14F specifications.
(d) The specific gravity range varies with color. Where a range of specific gravity is indicated, color variations of the compound are available.
(e) Specific heat resistance data are available upon request.

BAKELITE® PHENOLICS FOR COMPRES

AVERAGE PROPERTY VALUES

GENERAL PUR

PROPERTIES AND UNITS	ASTM Test Method	BMG-0425 BLACK 25	BMG-2010 COLORS	BMG-2700 BLACK 15 (a)	BMG-2798 BLACK 15 (a)	BMG-5000 BLACK 25 BRDWN 15	BMMB-502I BLACK 25 D
CHARACTERISTICS							
Resin Type		Two-Step	One-Step	One-Step	One-Step	Two-Step	Two-Step
Filler		Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Woodflour
Typical Use		Automotive, Electrical	Gen. Purpose	Closures	Min. Odor Gen. Purpose	Gen. Purpose	Gen. Purpos
Specific Gravity (d)	D-792	1.34	1.39-1.52	1.39	1.39	1.35—1.37	1.37
Bulk Factor, max.	D-392	2.5	2.6	2.4	2.4	2.6	2.5
Molding Shrinkage, inch/inch	D-955	0.006	0.006	0.006	0.007	0.005	0.005
Plasticity Range		4—15	6—15	4—12	4—15	6—18	6—18
MECHANICAL							
Tensile Strength, psi	D-651	7,800	7,500	8,700	7,000	9,000	9,100
Flexural Strength, psi	D-790	9,200	11,000	11,200	8,600	10,800	13,000
Modulus of Elast., 10^5 psi	D-790	8.4	10	9	9	12	11
Compressive Strength, psi	D-695	27,000	29,000	31,000	29,000	36,000	33,900
Izod Impact Strength, ft. lb./in. notch	D-256	0.29	0.29	0.28	0.26	0.30	0.30
THERMAL (e)							
Deflection Temp. @ 264 psi, °F	D-648	307	330	355	325	335	300
ELECTRICAL							
Dielectric Strength, Short Time volts/mil @ 23°C.	D-149	350	320	180	290	360	300
Volume Resistivity, 10^{11} ohm-cm	D-257	660	300	40	400	41	38
Dielectric Constant, 60 cycles	D-150	5.9	7.0	13.0	7.0	6.0	6.0
10^3 Cycles	D-150	5.8	6.0	11.0	6.0	5.0	5.5
10^6 Cycles	D-150	4.9	5.0	7.0	6.0	4.7	4.5
Dissipation Factor, 60 cycles	D-150	0.02	0.05	0.10	0.03	0.07	0.07
10^3 Cycles	D-150	0.02	0.02	0.09	0.02	0.04	0.04
10^6 Cycles	D-150	0.04	0.04	0.08	0.04	0.036	0.035
CHEMICAL							
Water Absorption, Gain in Wt., %	D-570	0.6	0.6	0.6	0.5	0.4	0.4
1% Soap Boil, 24 Hours	WC-169A	—	—	—	—	—	—

HEAT RESISTANT

PROPERTIES AND UNITS	ASTM Test Method	BMG-0500 BLACK 25 (b)	BMG-2011 BLACK 15 (a)(b)	BMRC-2035 BLACK 25	BMGA-5138 BLACK 25 (b)	BMMA-5280 BLACK 25	BMGA-5303 BLACK 25 (b)
CHARACTERISTICS							
Resin Type		Two-Step	One-Step	One-Step	Two-Step	Two-Step	Two-Step
Filler		Mineral	Mineral	Mineral	Mineral	Mineral	Mineral
Typical Use		Electrical Switchgear	Wet-Dry Applications	Appliance Parts	Appliance Parts	Electrical Components	Electrical Components
Specific Gravity (d)	D-792	1.61	1.50	1.50	1.44	1.51	1.60
Bulk Factor, max.	D-392	2.3	2.3	2.4	2.4	2.35	2.4
Molding Shrinkage, inch/inch	D-955	0.004	0.004	0.004	0.004	0.004	0.003
Plasticity Range		9—18	6—15	9—15	9—21	9—21	9—15
MECHANICAL							
Tensile Strength, psi	D-651	7,200	6,700	6,000	7,000	7,500	7,000
Flexural Strength, psi	D-790	10,000	8,400	7,500	10,000	9,000	9,000
Modulus of Elast., 10^5 psi	D-790	13	10	—	10	12	14
Compressive Strength, psi	D-695	32,000	29,500	29,000	32,000	32,000	31,000
Izod Impact Strength, ft. lb./in. notch	D-256	0.30	0.27	0.33	0.30	0.28	0.34
THERMAL (e)							
Deflection Temp. @ 264 psi, °F	D-648	355	390	355	355	350	350
ELECTRICAL							
Dielectric Strength, Short Time volts/mil @ 23° C.	D-149	310	200	300	300	350	290
Volume Resistivity, 10^{11} ohm-cm	D-257	420	6	—	18.0	33	34
Dielectric Constant, 60 Cycles	D-150	7.7	24.0	12.0	7.5	7.5	8.0
10^3 Cycles	D-150	6.5	14.5	9.0	6.4	6.2	6.4
10^6 Cycles	D-150	5.2	7.5	5.0	4.7	4.7	4.8
Dissipation Factor, 60 Cycles	D-150	0.13	0.30	0.019	0.15	0.13	0.15
10^3 Cycles	D-150	0.08	0.24	0.016	0.10	0.09	0.09
10^6 Cycles	D-150	0.06	0.08	0.074	0.05	0.04	0.04
CHEMICAL							
Water Absorption, Gain in wt., %	D-570	0.3	0.6	0.3	0.2	0.2	0.1
1% Soap Boil, 24 Hours	WC-169A	—	—	—	—	—	—

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COMPRESSION, PLUNGER AND INJECTION MOLDING
BAKELITE
CARBIDE

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Union Carbide trial exhibit UC-5353: Union Carbide Bakelite Phenolics for Compression, Plunger and Injection Mold...
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BAKELITE® PHENOLIC MOLDING MATERIALS

UNION CARBIDE

Average Property Values

PROPERTIES AND UNITS	ASTM Test Method	HEAT RESISTANT									IMPROVED IMPACT					
		BMS 0500 BLACK 25 (a)	BMS 2011 BLACK 15 (a)(b)	BMRC 2035 BLACK 25	BMCA 5138 BLACK 25 (a)	BMMA 5288 BLACK 25	BMCA 5393 BLACK 25 (a)	BMMC-5333 BLACK 25 DC	BMCA 5867 BLACK 25	BMCF 8335 BLACK 35	BMS 2051 BLACK 35	BMS-2080 BLACK 25	BMS 2933 BLACK 15 (a)	BMS-5115 BLACK 25	BMS 5318 BLACK 25	BMS 540 BLACK 15
CHARACTERISTICS																
Resin Type		Two Step	One Step	One Step	Two Step	Two Step	Two Step	Two Step	Two Step	Two Step	One Step	One Step	One Step	Two Step	Two Step	Two Ste
Filler		Mineral	Mineral	Mineral	Mineral	Mineral	Mineral	Mineral	Mineral	Mineral	Flock	Flock	Flock	Flock	Flock	Flock
Typical Use		Electrical Switchgear	Wet Dry Applications	Appliance Parts	Appliance Parts	Electrical Components	Electrical Components	Appliance & Electrical Parts	Appliance Parts	Knobs & Handles	Electric Switches	Wet Dry Applications	Wet Dry Applications	Wet Dry Applications	Wet Dry Applications	Pump Impeller
Specific Gravity (c)	D 792	1 61	1 50	1 50	1 44	1 51	1 60	1 40	1 51	1 61	1 37	1 37	1 36	1 36	1 36	1 37
Bulk Factor, max.	D 392	2 3	2 3	2 4	2 4	2 35	2 4	2 6	2 5	2 35	2 8	3 2	2 6	3 5	3 6	2 9
Molding Shrinkage, inch/inch	D 955	0 004	0 004	0 004	0 004	0 004	0 003	0 004	0 004	0 003	0 006	0 006	0 006	0 004	0 001	0 004
Plasticity Range		9–18	6–15	9–15	9–21	9–21	9–15	6–15	9–21	6–15	6–15	9–18	6–18	6–18	9–18	6–15
MECHANICAL																
Tensile Strength, psi	D 651	7,200	6,700	6,000	7,000	7,500	7,000	6 800	5,500	5,800	7,200	7,600	7,600	7,800	7,900	7,800
Flexural Strength, psi	D 790	10,000	8,400	7,500	10,000	9,000	9,000	10,500	8,000	8,000	10,200	10,200	9,000	10,300	10,100	10,300
Modulus of Elast., 10⁶ psi	D 790	13	10	–	10	12	16	12	12	14	9	7 5	8 8	9 8	10	9 8
Compressive Strength, psi	D 695	32,000	29,500	29,000	32,000	32,000	31,000	30,000		30,000	27,400	27,000	28,800	36,000	35 600	36,000
Izod Impact Strength, ft lb /in. notch	D 256	0 30	0 27	0 33	0 30	0 28	0 34	0 27	0 29	0 32	0 40	0 48	0 35	0 38	0 48	0 35
THERMAL (c)																
Deflection Temp @ 264 psi, °F	D 648	355	390	355	355	350	350	350	370	330	350	310	350	355	355	351
ELECTRICAL																
Dielectric Strength, Short Time volts/mil @ 23° C	D 149	310	200	300	300	350	290	300	280	290	280	270	230	280	300	28(
Volume Resistivity, 10¹⁴ ohm-cm	D 257	470	6	–	180	33	34	10	46	18	61	30	40	13	24	1
Dielectric Constant, 60 Cycles	D 150	7 7	240	120	7 5	7 5	80	85	80	110	7 0	110	120	110	90	11(
10³ Cycles	D 150	6 5	145	90	6 4	6 2	6 4	6 7	6 6	9 0	7 0	8 0	9 0	7 0	7 8	2(
10⁶ Cycles	D 150	5 2	7 5	5 0	4 7	4 7	4 8	5 0	4 8	6 0	6 0	6 0	6 0	5 0	5 0	5(
Dissipation Factor, 60 Cycles	D 150	0 13	0 30	0 019	0 15	0 13	0 15	0 2	0 14	0 17	0 10	0 20	0 27	0 20	0 12	0 2(
10³ Cycles	D 150	0 08	0 24	0 016	0 10	0 09	0 09	0 11	0 09	0 17	0 05	0 15	0 13	0 18	0 11	0 1(
10⁶ Cycles	D 150	0 06	0 08	0 014	0 05	0 04	0 04	0 04	0 04	0 05	0 04	0 05	0 6	0 05	0 05	0 0'
CHEMICAL																
Water Absorption, Gain in wt., %	D 570	0 3	0 6	0 3	0 2	0 2	0 1	0 2	0 1	0 1	0 6	0 4	0 4	0 3	0 3	0
5% Soap Boil, 24 Hours	MC 169A	–	–	–	–	–	–	–	–	–	–	2 6	1 9	2 7	2 5	

FOOTNOTES- (a) Not recommended for electrical applications.
(b) BMM Granulation for automatic powder molding is also available.
(c) Approved under MIL M 14F specifications.

(d) The specific gravity range varies with color. Where a ra
Indicated, color variations of the compound are availabl

(e) Specific heat resistance data are available upon reque

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UNION CARBIDE CORPORATION • Plastics
270 Park Avenue New York, N.Y. 10017

August, 1968
F-41735A

Union Carbide trial exhibit UC-5353: Union Carbide Bakelite Phenolics for Compression, Plunger and Injection Mold...
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BAKELITE® PHENOLIC MOLDING MATERIALS

UNION CARBIDE

Average Property Values

PROPERTIES AND UNITS	ASTM Test Method	GENERAL PURPOSE											ELECTRICAL INSULATING			CHEMICAL RESISTAN
		BMG-6425 BLACK 25	BMG-2810 COLORS	BMG-2700 BLACK 15[a]	BMG-2750 BLACK 15[a]	BMG 5000 BLACK 25 BROWN 15	BMMB 5028 BLACK 25 BC	BMG 5120 BLACK 25[a]	BMG 5450 BLACK 25[b]	BMM-7000 BLACK 25 BC BROWN 15	BMM 7002 BLACK 25 BC BROWN 15	BMMA-7333 BLACK 25 BC	BMG-8048 BLACK 25	BMG-8750 NATURAL [c]	BMG 5017 NATURAL	BMG 2158 BLACK 15[d]
TERISTICS																
Type		Two-Step	One Step	One Step	One Step	Two-Step	Two-Step	Two-Step	Two-Step	Two-Step	Two-Step	Two-Step	One Step	Two-Step	Two-Step	One Step
		Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Woodflour	Mineral	Mica	Mica	Woodflour
l Use		Automotive, Electrical	Gen. Purpose	Closures	Min. Odor Gen. Purpose	Gen. Purpose	Gen. Purpose	Switchboards	Appliance Parts	Gen. Purpose	Wiring Devices and Cases		Electrical Components	Electric Insulation	Automotive Ignition	Industrial Parts
ic Gravity[d]	D-792	1.34	1.39-1.52	1.39	1.39	1.35–1.37	1.37	1.34	1.42	1.36–1.39	1.35–1.39	1.38	1.78	1.68	1.84	1.45
Factor, max.	D-392	25	26	24	24	26	25	28	24	24	25	26	22	24	24	24
g Shrinkage, inch/inch	D-955	.006	.006	.006	.007	.005	.005	.005	.004	.004	.004	.004	.004	.004	.002	.007
city Range		4–15	6–15	4–12	4–15	6–18	6–18	6–15	3–18	4–18	6–15	6–15	26	6–15	4–15	4–15
IICAL																
e Strength, psi	D-651	7,800	7,500	8,700	7,000	9,000	8,100	8,500	7,500	6,900	9,000	7,000	5,600	6,600	7,100	7,000
al Strength, psi	D-790	9,700	11,000	11,200	8,600	10,800	13,000	11,000	9,200	7,900	11,900	9,900	8,500	8,700	9,000	9,000
ulus of Elast., 10⁶ psi	D-790	0.4	10	9	9	12	11	10	10	10	10	10	21	20	22	8.7
ressive Strength, psi	D-695	27,000	29,000	31,000	29,000	36,000	33,900	33,400	32,100	35,000	36,200	30,300	28,000	28,000	26,000	31,000
mpact Strength, ft. lb /in notch	D-256	0.29	0.29	0.28	0.26	0.30	0.30	0.33	0.29	0.30	0.31	0.31	0.33	0.35	0.35	0.26
l (e)																
ction Temp. @ 264 psi, °F	D-648	307	330	355	325	335	300	320	320	330	327	320	310	310	330	350
CAL																
tric Strength, Short Time																
s/mil @ 23°C.	D-149	350	320	180	290	360	300	360	360	350	380	310	430	370	360	285
e Resistivity, 10¹² ohm-cm	D-257	660	300	40	400	41	38	79	56	36	4	11	6,400	1,000	400	150
tric Constant, 60 cycles	D-150	5.9	7.0	13.0	7.0	6.0	6.0	6.0	6.0	6.0	10.0	6.3	5.2	5.0	5.6	13.0
10³ Cycles	D-150	5.8	6.0	11.0	6.0	5.0	5.5	5.0	5.0	5.0	7.0	5.6	4.9	4.6	5.3	9.0
10⁶ Cycles	D-150	4.9	5.0	7.5	6.0	4.7	4.5	4.6	4.7	4.0	5.0	4.5	4.6	4.5	4.7	6.0
ation Factor, 60 cycles	D-150	0.02	0.05	0.10	0.03	0.07	0.07	0.07	0.07	0.07	0.40	0.11	0.03	0.03	0.05	0.20
10³ Cycles	D-150	0.02	0.02	0.09	0.02	0.04	0.04	0.04	0.04	0.04	0.13	0.06	0.02	0.03	0.04	0.10
10⁶ Cycles	D-150	0.04	0.04	0.08	0.04	0.036	0.035	0.034	0.029	0.04	0.05	0.04	0.018	0.015	0.01	0.06
LI																
Absorption, Gain in Wt., %	D-570	0.5	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.7	0.5	0.5	0.02	0.03	0.05	0.3
ap Boil, 24 Hours	WC 16SA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.9

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FOOTNOTES: (a) Not recommended for electrical applications
(b) BMM Granulation for automatic powder molding is also available.
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(d) The specific gravity range varies with color. Where a range of specific gra indicated, color variations of the compound are available
(e) Specific heat resistance data are available upon request.

ARBIDE CORPORATION • Plastics
Avenue, New York, N.Y. 10017

August, 1960
F-41735A

