

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 January 2002 (10.01.2002)

PCT

(10) International Publication Number
WO 02/02663 A3

(51) International Patent Classification⁷: C08F 297/04,
C08L 23/00, 53/02

(21) International Application Number: PCT/US01/20225

(22) International Filing Date: 25 June 2001 (25.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/215,478 30 June 2000 (30.06.2000) US

(71) Applicant (for all designated States except US): KRATON
POLYMERS RESEARCH, B.V. [NL/NL]; Badhuisweg
3, NL-1031-CM Amsterdam (NL).

(72) Inventors; and

(75) Inventors/Applicants (for US only): HOXMEIER,
Ronald, James [US/US]; 2443 Briarwest Blvd., Houston,
TX 77077 (US). MASSE, Michael, Alan [US/US]; 3223
Sage Terrace Lane, Katy, TX 77450 (US).

(74) Agent: TACKETT, Keith, M.; Thomason, Moser & Pat-
terson, LLP, 3040 Post Oak Blvd., Suite 1500, Houston, TX
77056 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ,

DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,
NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM,
TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,
IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF,
CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv)) for US only

Published:

— with international search report

(88) Date of publication of the international search report:
27 June 2002

(15) Information about Correction:

Previous Correction:

see PCT Gazette No. 14/2002 of 4 April 2002, Section II

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 02/02663 A3

(54) Title: BLOCK COPOLYMERS CONTAINING BOTH POLYSTYRENE AND LOW VINYL CONTENT POLYDIENE HARD BLOCKS

(57) Abstract: The present invention provides block copolymers which have reduced solvent sensitivity and which overcome the foregoing disadvantages. In one embodiment of the present invention, there is provided an asymmetric block copolymer of the structure A-B-C-A wherein each A block is formed of a vinyl aromatic hydrocarbon, preferably styrene, and has a weight average molecular weight of 5,000 to 50,000. B is a polybutadiene block having a weight average molecular weight of 1,000 to 15,000 and a vinyl content of less than 25% by weight, and C is an elastomeric conjugated diene polymer block having a weight average molecular weight of 25,000 to 200,000 and has a vinyl content of 30 to 90%, preferably 35 to 80%, and most preferably 35 to 70% by weight. In the second embodiment of the present invention, there is provided a hydrogenated block copolymer of the formula A-B-C-B-A wherein A, B, and C have the definitions set forth above.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/20225

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 C08F297/04 C08L23/00 C08L53/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 C08F C08L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 555 930 A (SHELL INT RESEARCH) 18 August 1993 (1993-08-18) claims 1,5	1,2
X	US 5 795 944 A (GRAAFLAND TEUNIS ET AL) 18 August 1998 (1998-08-18) examples	1
A	EP 0 976 871 A (BOMAG GMBH & CO OHG ; STEHR JUERGEN (DE)) 2 February 2000 (2000-02-02) claims 1,6; examples	1
A	US 5 202 387 A (HALASA ADEL F ET AL) 13 April 1993 (1993-04-13) claim 1	1
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

18 February 2002

Date of mailing of the international search report

28/02/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Meulemans, R

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/20225

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 409 580 A (JAPAN SYNTHETIC RUBBER CO LTD) 23 January 1991 (1991-01-23) page 1, line 27-40 ---	1
A	EP 0 254 346 A (SHELL INT RESEARCH) 27 January 1988 (1988-01-27) claim 1 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/20225

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0555930	A	18-08-1993	AT 155802 T	15-08-1997
			AU 660351 B2	22-06-1995
			AU 3297493 A	19-08-1993
			BR 9300552 A	17-08-1993
			CA 2089344 A1	14-08-1993
			CN 1075322 A ,B	18-08-1993
			DE 69312342 D1	04-09-1997
			DE 69312342 T2	11-12-1997
			DK 555930 T3	25-08-1997
			EP 0555930 A2	18-08-1993
			ES 2105068 T3	16-10-1997
			FI 930600 A	14-08-1993
			GR 3024639 T3	31-12-1997
			JP 5279519 A	26-10-1993
			NO 303501 B1	20-07-1998
US 5863978 A	26-01-1999			
US 5795944	A	18-08-1998	BR 9701296 A	10-11-1998
			CA 2200020 A1	18-09-1997
			DE 69701296 D1	23-03-2000
			DE 69701296 T2	27-07-2000
			EP 0796871 A2	24-09-1997
			ES 2142131 T3	01-04-2000
			JP 9328504 A	22-12-1997
			TW 425409 B	11-03-2001
			ZA 9702227 A	25-09-1997
EP 0976871	A	02-02-2000	DE 19834655 A1	03-02-2000
			EP 0976871 A1	02-02-2000
US 5202387	A	13-04-1993	BE 1006407 A3	16-08-1994
			BR 9301750 A	16-11-1993
			CA 2076075 A1	09-11-1993
			DE 4315300 A1	11-11-1993
			ES 2074398 A1	01-09-1995
			FR 2691466 A1	26-11-1993
			GB 2267285 A ,B	01-12-1993
			IT 1261467 B	23-05-1996
			JP 6032852 A	08-02-1994
			MX 9302630 A1	01-11-1993
NL 9300752 A	01-12-1993			
EP 0409580	A	23-01-1991	JP 2697173 B2	14-01-1998
			JP 3074409 A	29-03-1991
			DE 69019079 D1	08-06-1995
			DE 69019079 T2	05-10-1995
			EP 0409580 A2	23-01-1991
			JP 3128957 A	31-05-1991
			US 5216074 A	01-06-1993
EP 0254346	A	27-01-1988	AU 593666 B2	15-02-1990
			AU 7530387 A	14-01-1988
			BR 8703432 A	22-03-1988
			CA 1309530 A1	27-10-1992
			DE 3783527 D1	25-02-1993
			DE 3783527 T2	13-05-1993
			EP 0254346 A2	27-01-1988
			ES 2053521 T3	01-08-1994

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/20225

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0254346	A	JP 2665660 B2	22-10-1997
		JP 63033463 A	13-02-1988
		KR 9610840 B1	09-08-1996
