

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
3 June 2004 (03.06.2004)

PCT

(10) International Publication Number
WO 2004/046167 A3

(51) International Patent Classification⁷: **A61K 38/02**

(21) International Application Number:
PCT/US2003/036397

(22) International Filing Date:
14 November 2003 (14.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/426,189 14 November 2002 (14.11.2002) US

(71) Applicants (*for all designated States except US*):
NORTHWESTERN UNIVERSITY [US/US]; 1880
Oak Avenue, Suite 100, Evanston, IL 60201 (US).
CLAUSSEN, Randal, C. [US/US]; 826 Greenwood
Avenue, Wilmette, IL 60091 (US).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **STUPP, Samuel, I.**
[US/US]; 57 E. Delaware Place, Apartment 2802, Chicago,
IL 60611 (US). **RABATIC, Bryan, M.** [US/US]; 1575 Oak
Avenue, Apartment 61, Evanston, IL 60201 (US).

(74) Agent: **MILLER, Raymond, A.**; Pepper Hamilton LLP,
500 Grant Street, One Mellon Center, 50th Floor, Pitts-
burgh, PA 15219 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT (util-
ity model), AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,
CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE
(utility model), DE, DK (utility model), DK, DM, DZ, EC,
EE (utility model), EE, EG, ES, FI (utility model), 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, NI, NO, NZ, OM, PG, PH, PL,
PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL,
SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN,
YU, ZA, ZM, ZW.

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

Published:

- with international search report
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments

(88) Date of publication of the international search report:
7 July 2005

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: SYNTHESIS AND SELF-ASSEMBLY OF ABC TRIBLOCK BOLA PEPTIDE

(57) **Abstract:** The present invention provides for bola amphiphiles compositions which have more than one lyophilic (hydrophilic) head group and a hydrophobic (hydrophobic) moiety capable of hydrogen bonding with other bola amphiphiles. These bola amphiphiles are capable of self assembling into micelles. The advantage of these bola amphiphiles is that they may self-assemble into micelles whose lyophilic head groups are located within the core and on the surface of the micelles. The lyophilic environment at the core and on the surface of the micelles may be different and may be controlled by the choice of head group moieties on the bola amphiphiles. The utility of these compositions is that they can be used to load or encapsulate polar drugs, DNA, mineralizable inorganic salts, or other molecules of interest within the polar interior of the micelle. Such compositions may also provide small water-filled ion-conducting channels within their structure suitable for use in micro electromechanical devices, as templates for nanowires or dielectrics, and as chemical sensors.



WO 2004/046167 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/36397^{II} -

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A61K 38/02

US CL : 514/02

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)

U.S. : 514/02, 15, 16, 17, 18, 19; 530/330, 331, 345

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 practicable, search terms used)
CAS Online

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,208,111 A (DECHER et al) 04 May 1993 (04.05.1993), see entire document.	1-36
A	WO 97/20639 A1 (ARNEBRANT et al) 12 June 1997 (12.06.97), see entire document.	1-36

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier application or patent 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

"&"

document member of the same patent family

Date of the actual completion of the international search

15 April 2005 (15.04.2005)

Date of mailing of the international search report

17 MAY 2005

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

David Lukton

Telephone No. 703-308-0196