

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
1 March 2007 (01.03.2007)

PCT

(10) International Publication Number
WO 2007/025104 A2

(51) International Patent Classification:

B01D 71/02 (2006.01) **C01B 31/02** (2006.01)
B01D 67/00 (2006.01)

(21) International Application Number:

PCT/US2006/033180

(22) International Filing Date: 23 August 2006 (23.08.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/711,436 24 August 2005 (24.08.2005) US

(71) Applicant (for all designated States except US): **THE REGENTS OF THE UNIVERSITY OF CALIFORNIA** [US/US]; 1111 Franklin Street, 5th Floor, Oakland, CA 94607-5200 (US).

(71) Applicants (for US only): **HOLT, Jason** [US/US]; 5972 Zinn Drive, Oakland, CA 94611 (US). **NOY, Aleksandr** [US/US]; 2411 Cipriani Boulevard, Belmont, CA 94002 (US). **PARK, Hyung, Gyu** [KR/US]; 3203 Yosemite Avenue, El Cerrito, CA 94530 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **BAKAJIN, Oligica** [YU/US]; 16091 Gramercy Drive, San Leandro, CA 94578 (US).

(74) Agents: **RUTT, J., Steven** et al.; **FOLEY & LARDNER, LLP**, 1530 Page Mill Road, Palo Alto, CA 94304-1125 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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

Declaration under Rule 4.17:

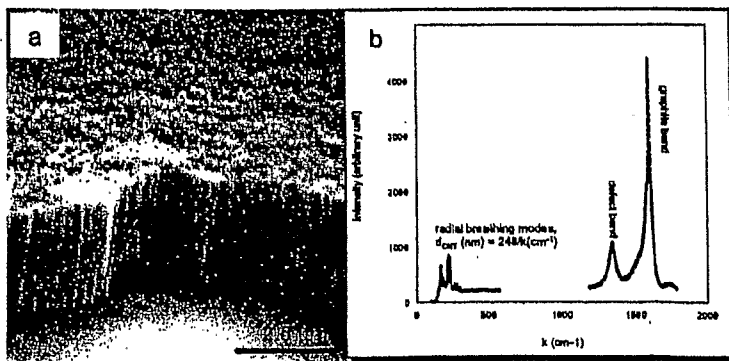
— as to non-prejudicial disclosures or exceptions to lack of novelty (Rule 4.17(v))

Published:

— without international search report and to be republished upon receipt of that report
— with a declaration as to non-prejudicial disclosures or exceptions to lack of novelty

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.

(54) Title: MEMBRANES FOR NANOMETER-SCALE MASS FAST TRANSPORT



(57) Abstract: Nanoporous membranes comprising single walled, double walled, and multiwalled carbon nanotubes embedded in a matrix material were fabricated for fluid mechanics and mass transfer studies on the nanometer scale and commercial applications. Average pore size can be 2 nm to 20 nm, or seven nm or less, or two nanometers or less. The membrane can be free of large voids spanning the membrane such that transport of material such as gas or liquid occurs exclusively through the tubes. Fast fluid, vapor, and liquid

transport are observed. Versatile micromachining methods can be used for membrane fabrication. A single chip can comprise multiple membranes. These membranes are a robust platform for the study of confined molecular transport, with applications in liquid and gas separations and chemical sensing including desalination, dialysis, and fabric formation.