

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
4 December 2003 (04.12.2003)

PCT

(10) International Publication Number
WO 2003/100878 A3

(51) International Patent Classification⁷: **H01L 51/20**

(21) International Application Number:
PCT/US2003/015512

(22) International Filing Date: 16 May 2003 (16.05.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/151,856 20 May 2002 (20.05.2002) US

(71) Applicant: **HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P.** [US/US]; 20333 S.H. 249, Houston, TX 77070 (US).

(72) Inventors: **KORNILOVICH, Pavel**; 2876 NW Audene Drive, Corvallis, OR 97330 (US). **CHANG, Shun-Chi**; 1951 Latham Street #1, Mountain View, CA 94040 (US). **BRATKOVSKI, Alexandre, M.**; 127 Laurel Way, Mountain View, CA 94040 (US). **WILLIAMS, R., Stanley**; 1512 Edgewood Road SE, Redwood City, CA 94062 (US).

(74) Agent: **LEE, Denise, A.**; Hewlett-Packard Company, Intellectual Property Administration, P O Box 272400, Fort Collins, CO 80527-2400 (US).

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

(84) Designated States (*regional*): ARIPO patent (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).

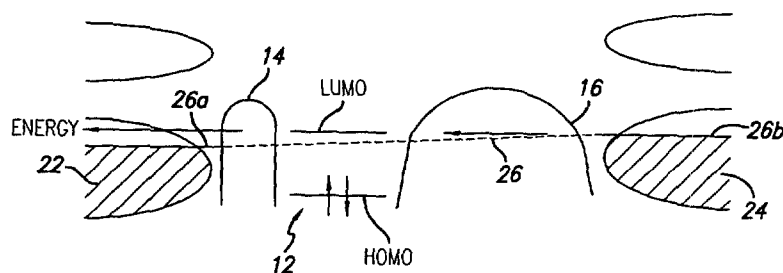
Published:

- 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:
1 April 2004

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: A LOW-FORWARD-VOLTAGE MOLECULAR RECTIFIER



(57) Abstract: A single molecular species having a low-forward-voltage rectifying property is provided. The molecular species is represented by the formula (a), where A is a "conducting" moiety (with a relatively narrow HOMO-LUMO gap), IL and IR are each an "insulating" moiety (with a relatively wide HOMO-LUMO gap), CL is a connecting group for an attachment to a first electrode, and CR is a

connecting group for attachment to a second electrode. Also, a low-forward-voltage rectifying molecular rectifier is provided, comprising the molecular species attached between the two electrodes. The present teachings provide a set of design rules to build single-molecule rectifying diodes that operate at low forward and large reverse voltages. Such single-molecule rectifying diodes are useful in a variety of nano-scale applications.