

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
15 February 2001 (15.02.2001)

PCT

(10) International Publication Number
WO 01/10871 A1(51) International Patent Classification⁷: C07F 7/08,
C08G 77/06(US). TERROBA, Rachel; 18237 Mount Baldy Circle,
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(21) International Application Number: PCT/US00/21455

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(22) International Filing Date: 3 August 2000 (03.08.2000)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:
60/147,435

4 August 1999 (04.08.1999) US

(81) Designated States (*national*): AE, AL, AM, AT, AU, AZ,
BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK,
DM, 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, NO, NZ, PL, PT,
RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA,
UG, UZ, VN, YU, ZA, ZW.(71) Applicant: HYBRID PLASTICS [—/US]; 18237 Mount
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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), OAPI patent (BF, BJ, CF, CG,
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Published:

— With international search report.

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: PROCESS FOR THE FORMATION OF POLYHEDRAL OLIGOMERIC SILSESQUIOXANES

WO 01/10871 A1

(57) Abstract: Three processes for the manufacture of polyhedral oligomeric silsesquioxanes (POSS) which utilize the action of bases that are capable of either attacking silicon or any compound that can react with a protic solvent (e.g. ROH, H₂O etc.) and generate hydroxide [OH]⁻; alkoxide [RO]⁻, etc. The first process utilizes such bases to effectively redistribute the silicon-oxygen frameworks in polymeric silsesquioxanes [RSiO_{1.5}]_n, where *n*=1-1,000,000 or higher into POSS nanostructures of formulas [(RSiO_{1.5})_n]₂, homoleptic, [(RXSiO_{1.5})_n]₂, functionalized homoleptic, [(RSiO_{1.5})_m(R'SiO_{1.5})_n]₂, heteroleptic, and [(RSiO_{1.5})_m(RXSiO_{1.0})_n]₂, functionalized heteroleptic nanostructures. The second process utilizes base to aid in the formation of POSS nanostructures of formulas [(RSiO_{1.5})_n]₂, homoleptic and [(RSiO_{1.5})_m(R'SiO_{1.5})_n]₂, heteroleptic and [(RSiO_{1.5})_m(RXSiO_{1.0})_n]₂, functionalized heteroleptic nanostructures from silanes RSiX₃ and linear or cyclic silsesquioxanes of the formula RX₂Si(OSiRX)_mOSiRX₂ where *m*=0-10, X=OH, Cl, Br, I, alkoxide OR, acetate OOCR, peroxide OOR, amine NR₂, isocyanate NCO, and R. The third process utilizes base to selectively ring-open the silicon-oxygen-silicon (Si-O-Si) bonds in POSS structures to form POSS species with incompletely condensed nanostructures. These processes also afford stereochemical control over X. The three processes result in new POSS species that can undergo additional chemical manipulations to ultimately be converted into POSS-species suitable for polymerization, grafting, or other desirable chemical reactions.