



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C07F 9/02, 15/00, B01J 31/00	A1	(11) International Publication Number: WO 98/21214 (43) International Publication Date: 22 May 1998 (22.05.98)
(21) International Application Number: PCT/US97/20390 (22) International Filing Date: 10 November 1997 (10.11.97) (30) Priority Data: 60/031,088 15 November 1996 (15.11.96) ✓ US 08/966,011 7 November 1997 (07.11.97) ✓ US (71) Applicant: CALIFORNIA INSTITUTE OF TECHNOLOGY [US/US]; 1200 East California Boulevard, Pasadena, CA 91125 (US). (72) Inventors: GRUBBS, Robert, H.; 1700 South Spruce Street, South Pasadena, CA 91030 (US). BELDERRAIN, Tomas, R.; c/o Jose De Espronceda, Dos Hermanas, 34, E-41700 Sevilla (ES). BROWN, Seth, N.; 857 Forest Avenue, South Bend, IN 46616 (US). WILHELM, Thomas, E.; 290 North Madison Avenue #206, Pasadena, CA 91101 (US). (74) Agents: BENGTSOON, W., Patrick et al.; Limbach & Limbach L.L.P., 2001 Ferry Building, San Francisco, CA 94111-4262 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: SYNTHESIS OF RUTHENIUM OR OSMIUM METATHESIS CATALYSTS (57) Abstract The present invention relates to the synthesis of highly active ruthenium and osmium carbene metathesis catalyst in good yield from readily available starting materials. The catalysts that may be synthesized are of general formula (I) wherein: M is ruthenium or osmium; X and X¹ are independently any anionic ligand; L and L¹ are any neutral electron donor ligand; and, R and R¹ are each hydrogen or one of the following substituent groups: C₂-C₂₀ alkenyl, C₂-C₂₀ alkynyl, C₁-C₂₀ alkyl, aryl, C₁-C₂₀ carboxylate, C₁-C₂₀ alkoxy, C₂-C₂₀ alkenyloxy, C₂-C₂₀ alkynyloxy, aryloxy, C₂-C₂₀ alkoxycarbonyl, C₁-C₂₀ alkylthio, C₁-C₂₀ alkylsulfonyl and C₁-C₂₀ alkylsufinyl. Optionally, the substituent group may be substituted with one or more groups selected from C₁-C₅ alkyl, halogen, C₁-C₅ alkoxy, and aryl. When the substitute aryl group is phenyl, it may be further substituted with one or more groups selected from a halogen, a C₁-C₅ alkyl, or a C₁-C₅ alkoxy. Specific synthetic protocols for vinyl alkylidene catalysts wherein R is hydrogen and R¹ is -CHCR¹²R¹³ and non-vinyl alkylidene catalysts are also disclosed. In addition to the ease of synthesis (typically a one-step synthesis), the reactions generally may be run at or above room temperature and the resulting products usually may be used without extensive post synthesis purification. (I)		