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| <b>(51) International Patent Classification:</b>                                                                                         |                             | <b>(72) Inventors:</b> <b>TANUR, Adrienne</b> ; 202 Olson Way, Sunnyvale, California 94086 (US). <b>USEN, Ndifreke, Ini</b> ; 406 Van Buren Ave #206, Oakland, California 94610 (US). <b>SCHAMMEL, Wayne, P.</b> ; 343 Sierra Point Road, Brisbane, California 94005 (US). <b>HAROUN, Yacine</b> ; 1417 Marina Circle, Davis, California 95616 (US). <b>FREER, Erik, M.</b> ; 168 Paseo Court, Mountain View, California 94043 (US). <b>CIZERON, Joel, M.</b> ; 923 Emerald Hill Road, Redwood City, California 94061 (US). |
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**(54) Title:** CATALYSTS AND METHODS FOR OXIDATIVE COUPLING OF METHANE

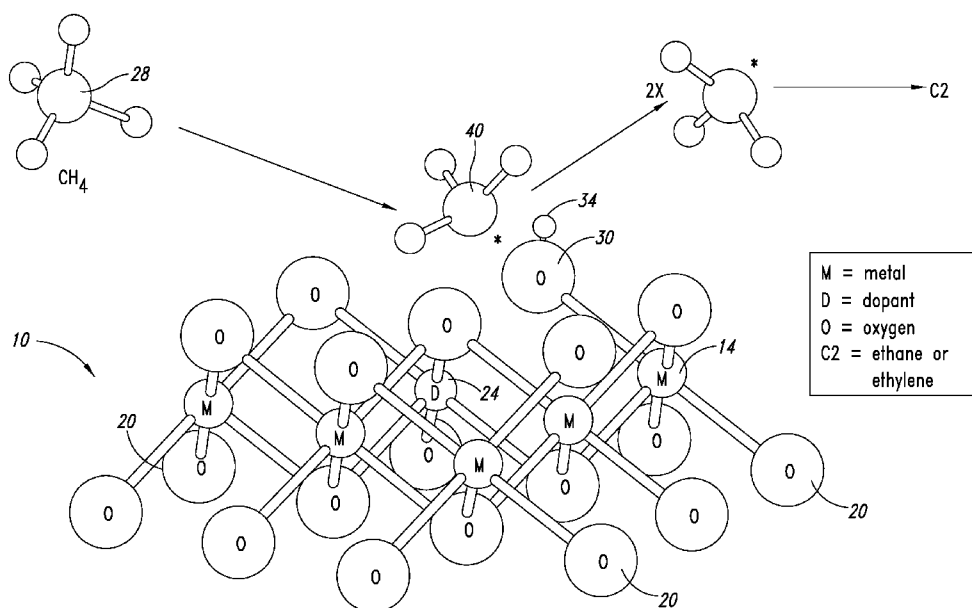


FIG. 1

**(S7) Abstract:** Catalysts comprising the following formula are provided:  $A_xB_yC_vD_wO_z$  wherein : A is a lanthanide or group 4 element; B is a group 2 element; C is a group 13 element; D is a lanthanide element; O is oxygen; v and w are independently 0 or a number greater than 0, provided at least one of v and w is a number greater than 0; x, y and z are independently numbers greater than 0, and v, w, x, y and z are selected such that  $A_xB_yC_vD_wO_z$  has an overall charge of 0. Further provided is a formed catalytic material comprising the catalyst, and a method for the oxidative coupling of methane, the method comprising contacting methane with the catalyst, thereby converting the methane to C2 hydrocarbons, C2+ hydrocarbons, or combinations thereof.

[Continued on next page]

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