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# Supporting Information



# Investigation of Ce–Zr Oxide-Supported Ni Catalysts in the Steam Reforming of *meta*-Cresol as a Model Component for Bio-Derived Tar

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**Table S1.** Frequencies of Raman modes observed in the case of ceria-zirconia supports and associated symmetries

| Vibration mode | Peak position of Raman frequencies ($cm^{-1}$) | | | |
|---|---|---|---|---|
| | m-$ZrO_2$ | IM | HT | CP |
| $A_g$[a] | 101; 476; 557; 635 | 101; 476; 557; 635 | 474; 457; 614; 635 | - |
| $A_g$[b] | 177; 189; | 177; 190 | 177; 189 | - |
| $A_g$[c] | 305; 344 | 305; 346 | 344 | - |
| $B_g$[a] | 500; 534; 614 | 500; 534; 615 | 500; 534 | - |
| $B_g$[b] | 220; 332 | 221; 333 | 220; 332 | - |
| $B_g$[c] | 378 | 381 | 378 | - |
| $F_{2g}$ | - | 465 | - | - |
| $A_{1g}$ | - | - | - | 625 |
| $E_g$ | - | - | 260[d]; 460 | 246[d]; 460[e] |
| $B_{1g}$ | - | - | 141; 314 | 141; 314 |

According to Kim et al:[1] [a] is attributed to (O-O) vibration, [b] is attributed to (Zr-Zr) vibration, [c] is attributed to (Zr-O) vibration. [d] and [e] is attributed (Zr-O) stretching and (M-O-M) asymmetric stretching, respectively according to Kim et al. [2]

**Table S2.** Result of the de-convolution of Ce $3d_{5/2}$ XPS bands

| Band | v = 882.25 ± 0.02 eV | | v = 885.15 ± 0.35 eV | | v = 888.7 ± 0.2 eV | |
|---|---|---|---|---|---|---|
| Catalyst | Area[a] | Area % | Area[a] | Area % | Area[a] | Area % |
| Ni/CP | 61185 | 54.3 | 29196 | 25.9 | 22265 | 19.8 |
| Ni/HT | 64596 | 47.4 | 58637 | 43.1 | 12957 | 9.5 |
| Ni/IM | 106305 | 48.8 | 48956 | 22.5 | 62502 | 28.7 |

[a] XPS count

**Reference**


[1] B. K. Kim, H. O. Hamaguchi, *Phys Status Solidi B* **1997**, *203*, 557-563.

[2] D. J. Kim, J. W. Jang, H. L. Lee, *J Am Ceram Soc* **1997**, *80*, 1453-1461.