Self-Assembly of Nanoparticles in a Modular Fashion to Prepare Multifunctional Catalysts for Cascade Reactions: From Simplicity to Complexity

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Figure S1. Low mag and high mag images of (a, b) pure mesoporous silica, (c, d) ZrO$_2$-SiO$_2$, (e, f) MgO-SiO$_2$. 
Figure S2. (a, b) The pictures of microfluidic chip, (c) the process of producing micro-droplets by microfluidic device.
Figure S3. The mass spectrogram of the final product of the cascade reaction.
Table S1. The mass fractions of Zr in ZrO$_2$-SiO$_2$ and Mg in MgO-SiO$_2$, respectively.

| Element | Zr  | Mg  |
|---------|-----|-----|
| Percentage (%) | 1.64 | 4.37 |
Table S2. Physical parameters of different mesoporous silica materials and the multi-modules microspheres.

| Sample          | Specific surface area (m²·g⁻¹) | Pore size (nm) | Pore volume (cm³·g⁻¹) |
|-----------------|---------------------------------|----------------|-----------------------|
| SiO₂            | 930.98                          | 3.07           | 0.56                  |
| ZrO₂-SiO₂       | 788.83                          | 2.96           | 0.54                  |
| MgO-SiO₂        | 246.34                          | 3.19           | 0.20                  |
| Multi-modules   | 439.51                          | 2.62           | 0.42                  |
| Microspheres    |                                 |                |                       |
Table S3. O 1s peak position of different mesoporous silica materials.

| Peak    | SiO$_2$ | ZrO$_2$-SiO$_2$ | MgO-SiO$_2$ |
|---------|---------|----------------|-------------|
| O 1s (eV) | 534    | 533.6          | 532.9       |