Supporting Information

Amorphous Mesoporous Magnesium Carbonate (MMC) as a functional support for UV blocking semiconductor nanoparticles for cosmetic applications

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EXPERIMENTAL

MATERIALS

Talcum USP grade median particle size 5.5 µm Making Cosmetics, Potato starch food grade Garant, Magnesium hydroxide BioUltra ≥99.0% (KT) Sigma-Aldrich.

All chemicals were used as bought without further purification.

RESULTS AND DISCUSSION

Figure S1. Emission spectrum of four UV-9W-L G23 type fluorescence tubes used for photocatalysis experiment.
Figure S2. Raman spectra of (a) ZnO (wurtzite) nanoparticles, (b) TiO$_2$ (rutile) nanoparticles, (c) MMC-TiO$_2$-ZnO and (d) MMC.
Figure S3. SEM-EDX maps of (a-d) MMC and (e-g) MMC-TiO\textsubscript{2}-ZnO on the elements carbon, oxygen and magnesium.

Table S1. Estimated elemental analysis of MMC and MMC-TiO\textsubscript{2}-ZnO obtained from SEM-EDX mappings of the areas shown in Figure S4.

<table>
<thead>
<tr>
<th>Element</th>
<th>MMC (at. %)</th>
<th>MMC-TiO\textsubscript{2}-ZnO (at. %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>64.6 ± 8.0</td>
<td>60.9 ± 5.6</td>
</tr>
<tr>
<td>Carbon</td>
<td>18.7 ± 2.0</td>
<td>17.5 ± 1.4</td>
</tr>
<tr>
<td>Magnesium</td>
<td>16.8 ± 1.6</td>
<td>13.5 ± 1.0</td>
</tr>
<tr>
<td>Titanium</td>
<td>—</td>
<td>4.1 ± 0.3</td>
</tr>
<tr>
<td>Zinc</td>
<td>—</td>
<td>4.0 ± 0.5</td>
</tr>
</tbody>
</table>
Figure S4. SEM-EDX spectra of (a) MMC-TiO2-ZnO and (b) MMC.

Figure S5. Differential pore volume distribution (■) and cumulative pore volume (●) of MMC.
Figure S6. Differential pore volume distribution (■) and cumulative pore volume (●) of MMC-TiO$_2$-ZnO.

Figure S7. UV-transmittance of (a) a PDMS covered PMMA plate and (b) a PMMA plate.
Figure S8. Light microscopy image of MMC particles.

Figure S9. The effect of talc mixed with TiO$_2$ (rutile) and ZnO nanoparticles on the adsorption and photocatalytic degradation of the anionic azo dye amaranth. The mixture contained an equal amount of TiO$_2$/ZnO as MMC-TiO$_2$-ZnO and the measurements were performed in triplicates.
**Figure S10.** The effect of starch mixed with TiO$_2$ (rutile) and ZnO nanoparticles on the adsorption and photocatalytic degradation of the anionic azo dye amaranth. The mixture contained an equal amount of TiO$_2$/ZnO as MMC-TiO$_2$-ZnO and the measurements were performed in triplicates.

**Figure S11.** The effect of Mg(OH)$_2$ mixed with TiO$_2$ and ZnO nanoparticles on the adsorption and photocatalytic degradation of the anionic azo dye amaranth. The mixture contained an equal amount of TiO$_2$/ZnO as MMC-TiO$_2$-ZnO and the measurements were performed in triplicates.
Figure S12. The effect of MgCO$_3$ on the adsorption and photocatalytic degradation of the anionic azo dye amaranth. The measurements were performed in triplicates.

Figure S13. The effect of starch on the adsorption and photocatalytic degradation of the anionic azo dye amaranth. The measurements were performed in triplicates.
Figure S14. The effect of Mg(OH)$_2$ on the adsorption and photocatalytic degradation of the anionic azo dye amaranth. The measurements were performed in triplicates.

Figure S15. The effect of talc on the adsorption and photocatalytic degradation of the anionic azo dye amaranth. The measurements were performed in triplicates.