

Application of Zirconia/Alumina Composite Oxide Ceramics as Photocatalysts for Removal of 2,4,6-Trichlorophenol from Water

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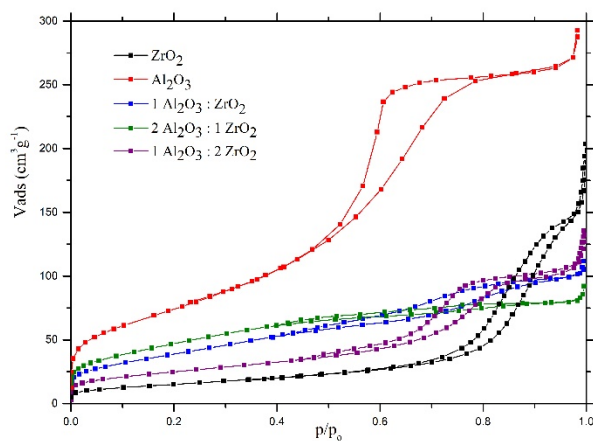


Figure S1. N₂adsorption/desorption isotherms of all samples.

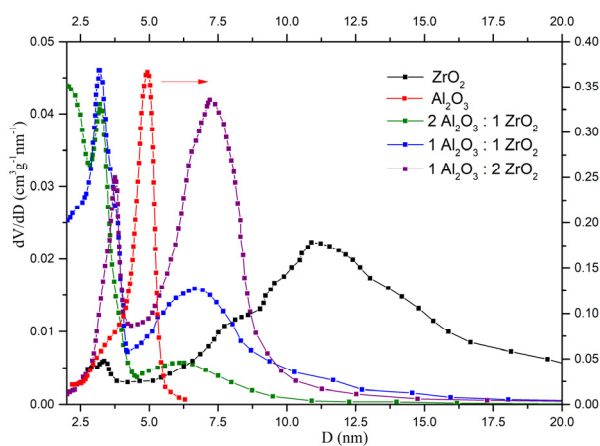


Figure S2. Pore size distributions patterns of all samples.

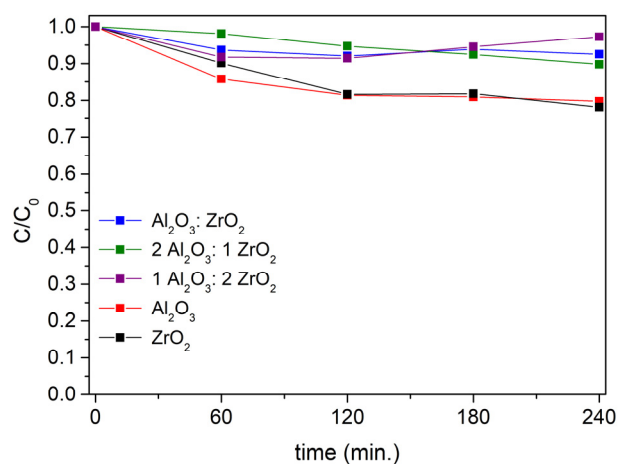


Figure S3. Kinetic curves TCP adsorption on composite samples, dark.

Table S1. Composition of pure zirconia powder, results obtained from SEM/EDX.

Element	Line Type	Apparent Concentration		k Ratio	Wt%	*Wt%	
O	K series	3.81		0.01284	18.15	24.51	1.53 mol
Zr	L series	27.99		0.27992	55.94	75.59	0.83 mol
Au	M series	14.08		0.14084	25.91		
Total:					100.00	100.00	

* After subtraction of Au.

Table S2. Composition of pure alumina powder, results obtained from SEM/EDX.

Element	Line Type	Apparent Concentration	k Ratio	Wt%	*Wt%	
C	K series	0.36	0.00355	17.07		
O	K series	6.99	0.02351	42.86	51.69	3.23
Al	K series	8.23	0.05913	40.06	48.31	1.3
Total:				100.00	100.00	

*After subtraction of C.

Table S3. Composition of 2Al₂O₃ : 1ZrO₂ nanocomposite powder, results obtained from SEM/EDX.

Element	Line Type	Apparent Concentration	k Ratio	Wt%	*Wt%	
O	K series	5.45	0.01833	35.79	39.82	2.49
Al	K series	3.87	0.02780	15.28	17.00	0.63
Zr	L series	9.46	0.09460	38.81	43.18	0.47
Au	M series	2.71	0.02706	10.13		
Total:				100.00	100.00	

*After subtraction of Au

Table S4. Composition of 1Al₂O₃ : 2ZrO₂ nanocomposite powder, results obtained from SEM/EDX.

Element	Line Type	Apparent Concentration	k Ratio	Wt%	*Wt%	
O	K series	2.42	0.00815	16.31	21.21	1.32
Al	K series	1.25	0.00895	3.97	5.16	0.2
Zr	L series	19.63	0.19627	56.63	73.63	0.81
Au	M series	8.72	0.08717	23.10		
Total:				100.00	100.00	

*After subtraction of Au

Table S5. Results obtained in this study together with our previous results of photocatalytical degradation of TCP in aqueous solutions with similar zirconia based photocatalysts, after 4 hours of illumination by Simulated Solar light. High Performance Liquid Chromatography (HPLC) was used for measurement of TCP concentrations.

sample	Crystal phase	% of removed TCP from the solution, HPLC	reference
ZrO ₂	Monocl./tetrag.	69.7	This study
Al ₂ O ₃	γ -alumina	97.54	
1Al:2Zr	Monocl./tetrag.	79.6	
Al:Zr	Tetragonal ZrO ₂	80.70	
2Al:1Zr	/	81.70	
ZrO ₂	Monocle./tetrag.	78.00	[7]

ZrO ₂ -Si ⁴⁺	tetragonal	81.00	[7]
ZrO ₂	Monocl./terag.	67.50	[8]
ZrO ₂ -1%Fe ³⁺	Monocl./terag.	88	[8]
ZrO ₂ -5%Fe ³⁺	Monocl./terag.	81	[8]
ZrO ₂ -10%Fe ³⁺	Monocl./terag.	85	[8]
ZrO ₂ -20%Fe ³⁺	tetragonal	90	[8]
ZrO ₂	teragonal	76.08	[9]
TiO ₂	Anatase/B	67.55	[9]
75%TiO ₂ -25%ZrO ₂	Anatase/terag.	74.84	[9]
50%TiO ₂ -50%ZrO ₂	Anatase/tetrag.	68.00	[9]
25%TiO ₂ -75%ZrO ₂	Anatase/tetrag.	59.68	[9]