

## Supplementary Materials

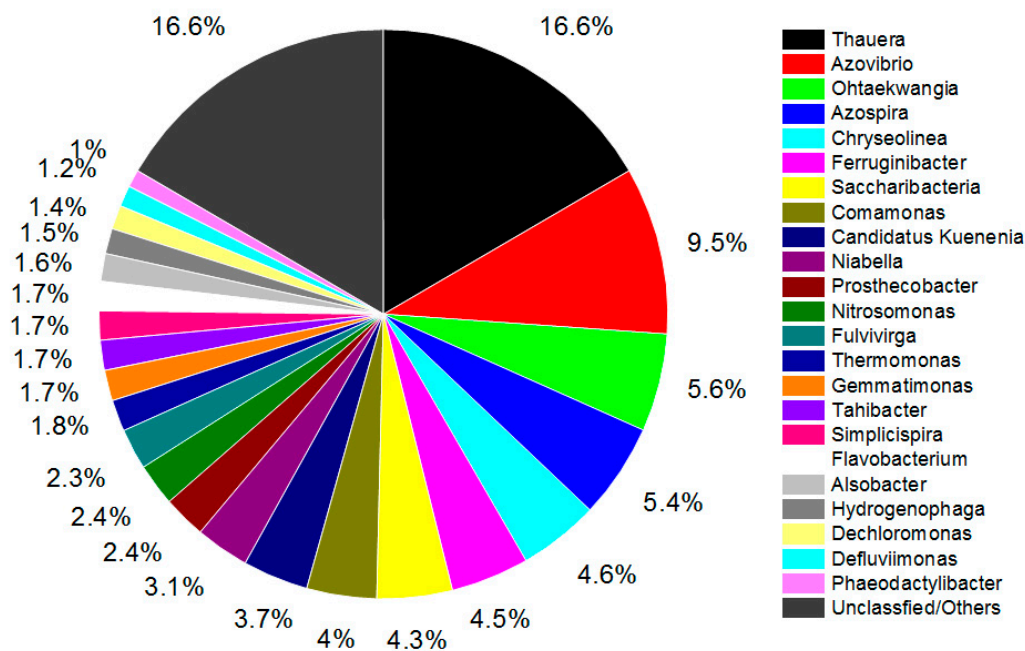
**Table S1.** Parameters of the PU foam.

Item	Unit	Value
Size	cm × cm × cm	2.5×2.5×2.5
Specific surface area	m <sup>2</sup> /g	≥23.3
Weight	kg/m <sup>3</sup>	23±0.5
Density	kg/m <sup>3</sup>	approximately 1000
Porosity	%	≥95
Stacking density	n/m <sup>3</sup>	8000

**Table S2.** Main fluorescence parameters of 3D-EEM under four scenarios (R1-R4).

EP S	Scenari o	Peak A		Peak B		Peak C		Peak D		Peak E		Peak F	
		Ex/E m	FI*	Ex/E m	FI	Ex/E m	FI	Ex/E m	FI	Ex/E m	FI	Ex/E m	FI
S- EP S	R1	280/	10	226/	28	-	-	-	-	-	-	-	-
		340	2	330	2								
	R2	284/	76	226/	16	230/	19	294/	15	-	-	-	-
		320		330	7	410	8	410	6				
	R3	274/	11	226/	29	-	-	-	-	-	-	-	-
		330	3	330	2								
	R4	280/	13	226/	33	-	-	320/	11	-	-	-	-
		330	3	340	3			380	8				
LB -E PS	R1	282/	10	226/	29	-	-	336/		-	-	-	-
		340	6	340	4			410	56				
	R2	282/	95	226/	23	-	-	336/	72	-	-	-	-
		330		330	1			410					
	R3	280/	12	228/	29	-	-	-	-	-	-	-	-
		340	8	345	7								
	R4	280/	13	226/	33	-	-	320/	11	-	-	-	-
		330	3	340	3			380	8				
TB -E PS	R1	284/	10	-	-	210/	10	310/	61	208/	10	208/	770
		365	14			425	14	400	1	490	14	530	
	R2	290/	99	-	-	208/	10	346/	10	210/	10	212/	609
		365	5			425	16	440	16	490	16	530	
	R3	287/	10	-	-	210/	10	317/	10	210/	10	208/	101
		370	12			425	12	395	12	490	12	530	2
	R4	278/	97	-	-	208/	97	320/	97	212/	86	208/	524
		354	4			425	4	385	4	490	1	530	

\* Fluorescence intensity of the peak.



**Figure S1.** Microbial community at genus level (in R3) based on high-throughput sequencing analysis