Table S1: The binding energy values for Ce3*d*, Zr3*d*, Au4*f* and O*1s* components of different samples.

Sample	$Ce3d_{5/2}$				$Zr3d_{5/2}$		$Au4f_{7/2}$		$O1s$		
	v	v^{I}	v^{II}	v^{III}	Zr^{4+}	Zr^{3+}	Au^{0}	Au^{3+}	O_L	O_{vac}	O_{OH}
$Ce_{0.5}Zr_{0.5}O_2$	883.9	885.5	889.3	899.4	182.0	180.3	-	-	530.3	528.0	532.0
0.1Au-$Ce_{0.5}Zr_{0.5}O_2$	883.8	885.4	889.2	899.3	182.0	180.3	84.0	86.6	530.0	528.0	532.0
0.2Au-$Ce_{0.5}Zr_{0.5}O_2$	883.4	885.3	889.3	899.2	182.0	180.3	84.0	86.6	530,0	528.1	531.9
0.5Au-$Ce_{0.5}Zr_{0.5}O_2$	882.5	885.2	889.2	899.0	182.0	180.1	83.9	86.6	530.0	528.3	531.9
1.0Au-$Ce_{0.5}Zr_{0.5}O_2$	882.6	885.2	889.0	898.0	182.0	180.1	83.8	86.5	530.0	528.3	531.9

Table S2: Production distribution in the photocatalytic reforming of aqueous bioethanol (20 vo1. %) over 1.0Au-$Ce_{0.5}Zr_{0.5}O_2$ catalyst

Products (mmol)	Percentage (%)
H_2	86.8
CO	0.4
CO_2	1.5
CH_4	1.4
C_2H_6	0.5
C_2H_4	0.7
CH_3CHO	4.6
CH_3COOH	2.7
$CH_3CH(OH)CH(OH)CH_3$	1.4