Table.1: Rietveld refined data from XRD patterns and oxygen vacancy value calculated by Raman spectra.

Samples/ different mole ratio	**Lattice parameters (a)**	**Calculated grain size (nm)**	**R_{wp}**	**Particles size (nm)**	**Area $_{Oxygen\ vacancies}$ /Area $_{F2g}$ (%)**
Pure CeO2	5.4178	4.50	5.86	~10	6.8
1 : 0.05	5.4190	4.6	5.26	~10	10.9
1 : 0.1	5.4240	4.52	5.76	~10	**11.2**
1 : 0.2	5.4228	4.54	5.05	~10	10.2
1 : 0.3	5.4249	4.6	4.87	~10	10.5
1 : 0.4	5.4273	4.63	5.62	~10	10.3

PS: Area $_{Oxygen\ vacancies}$ /Area $_{F2g}$ (%)=(Area $_{Rdoped}$+Area $_{Rce\text{-}o}$)/Area $_{Fag}$(%)

Table.2: Calculated [Ce^{3+}] and [O_{sur}] concentrations of as-fabricated samples from the XPS spectrum.

Sample/different mole ratio of Ce and Y	**[Ce^{3+}]/[Ce^{3+}+ Ce^{4+}] %**	**[O_{sur}]/[O_{sur}+O_{lat}] %**
Pure CeO2	19.0	40.5
1: 0.05	25.38	52.8
1: 0.1	**29.76**	**55.8**
1: 0.2	23.43	52.76
1: 0.3	24.00	53.59
1: 0.4	23.86	53.97

$$\frac{[Ce^{3+}]}{[Ce^{3+}+Ce^{4+}]} = \frac{area(V_0, V_1, U_0, U_1)}{total\ area}$$

$$\frac{[O_{sur}]}{[O_{sur}+O_{lat}]} = \frac{area(O_{sur})}{total\ area}$$