

### Supplementary figures

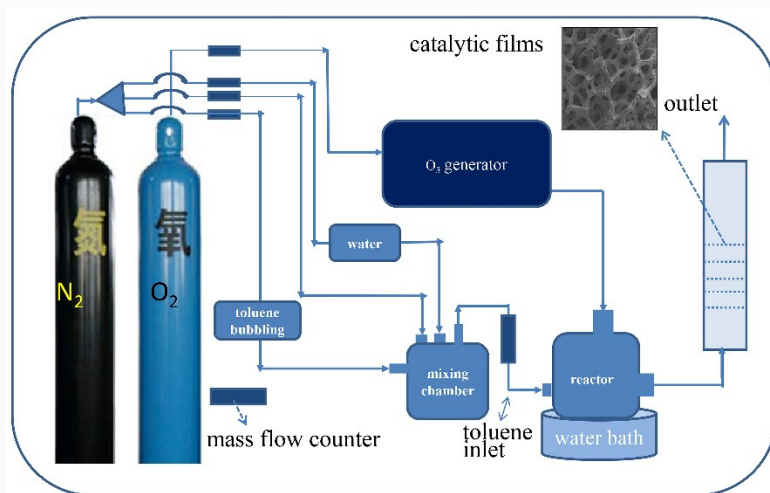


Fig. S1 Schematic of set-up for catalytic ozonation of gaseous toluene

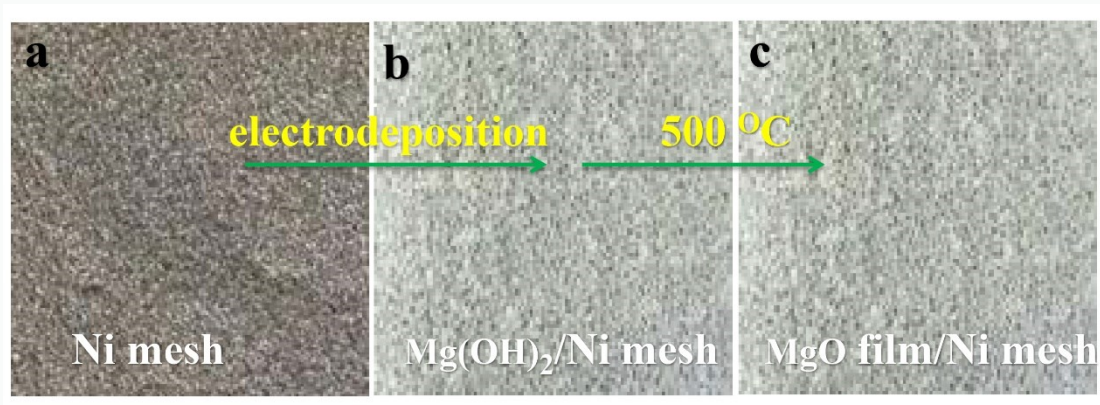


Fig. S2 Photos of Ni mesh and catalysts supported on Ni mesh: (a: Ni mesh, b: electrodeposited Mg(OH)<sub>2</sub> and c: MgO catalyst on Ni mesh).

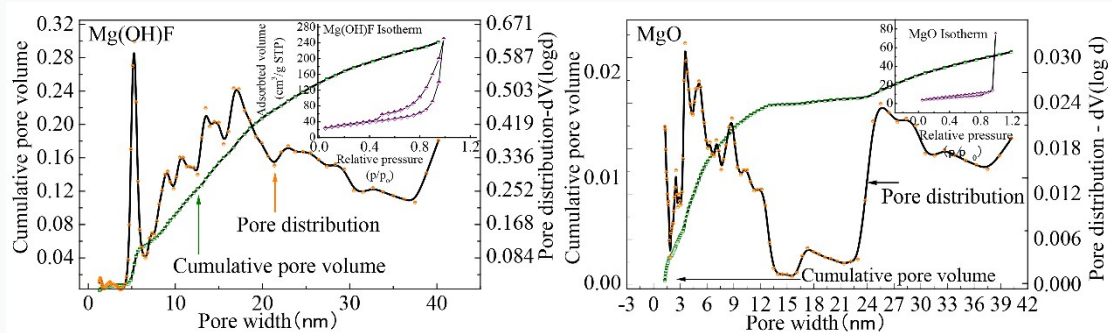


Fig.S3 BET adsorption curve and pore distribution calculated by DFT-model for catalysts: MgO and Mg(OH)F.

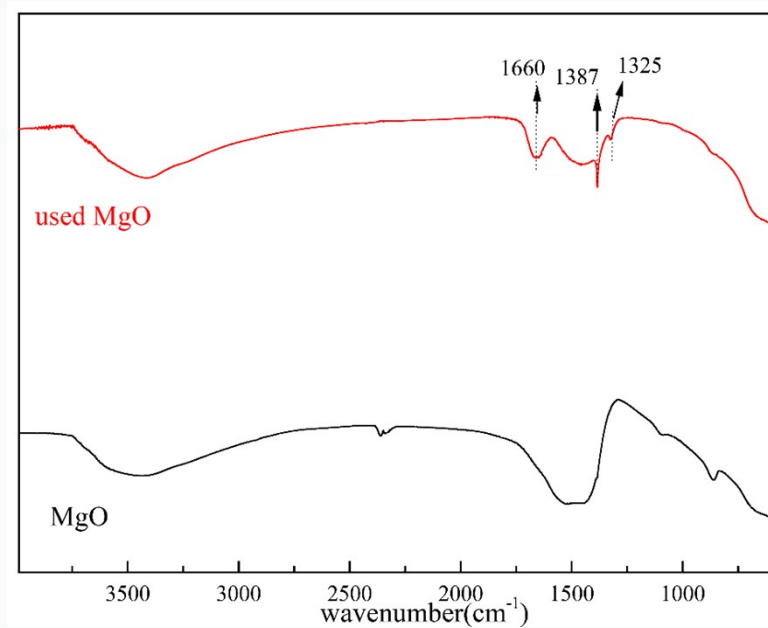


Fig. S4 IR spectra of MgO films and used MgO film.

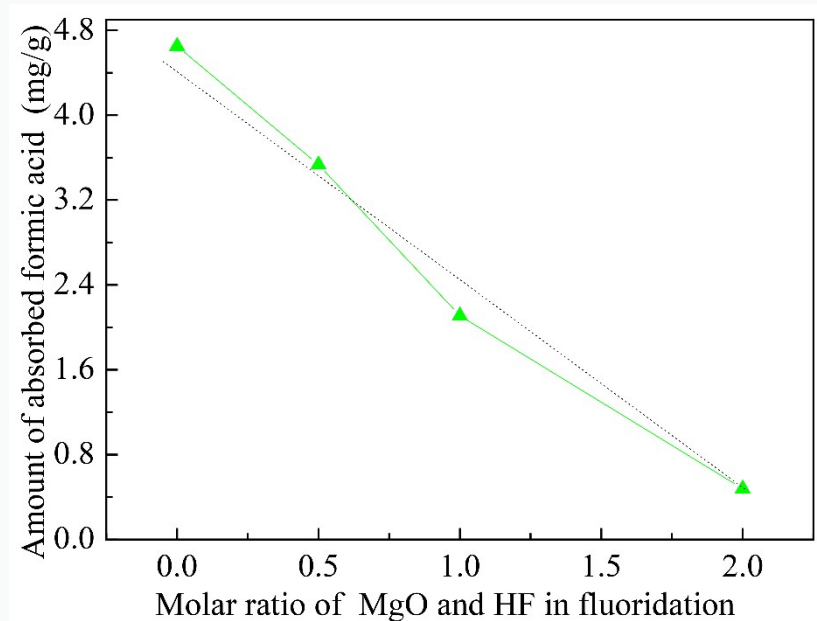


Fig. S5 The adsorbed amount of formic acid on catalysts for different fluorination ratio (MgO:HF)

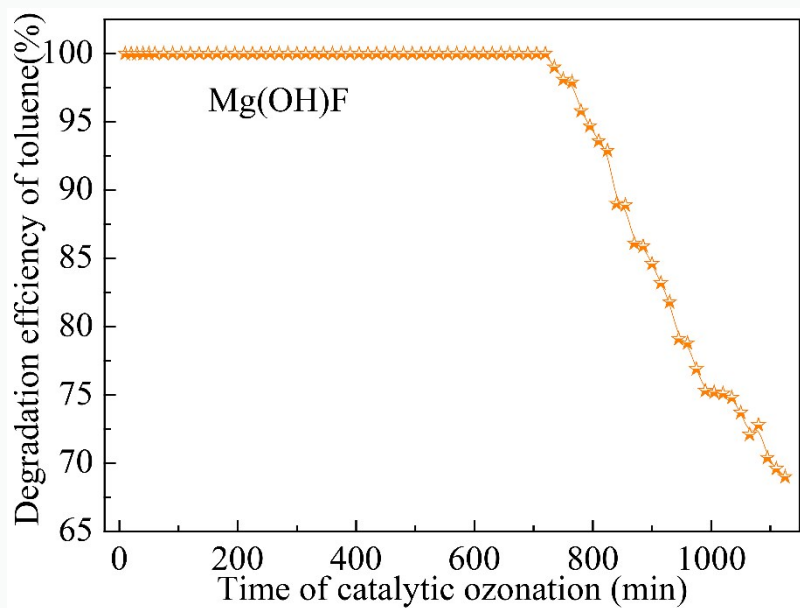


Fig. S6 Dependence of toluene degradation efficiency on time for Mg(OH)F catalyst in catalytic ozonation. (ozonation conditions: toluene gas:  $0.5 \text{ L min}^{-1}$  and 100 ppmv,  $\text{O}_3$ : 1000 ppmv and RT: 0.5s).