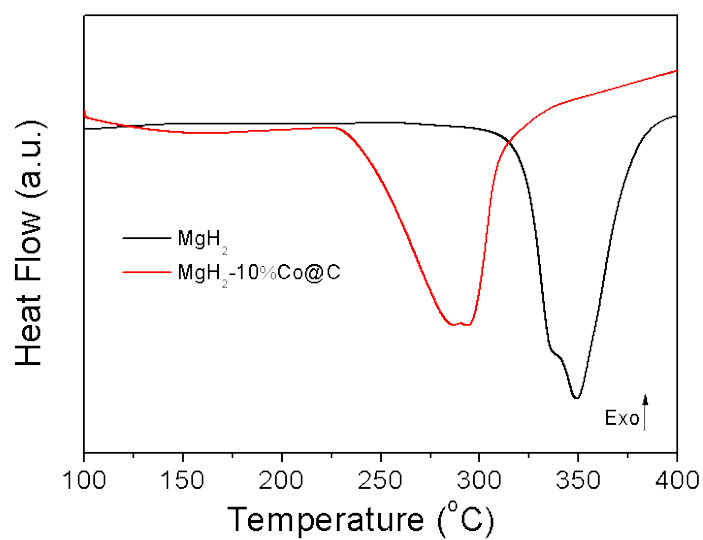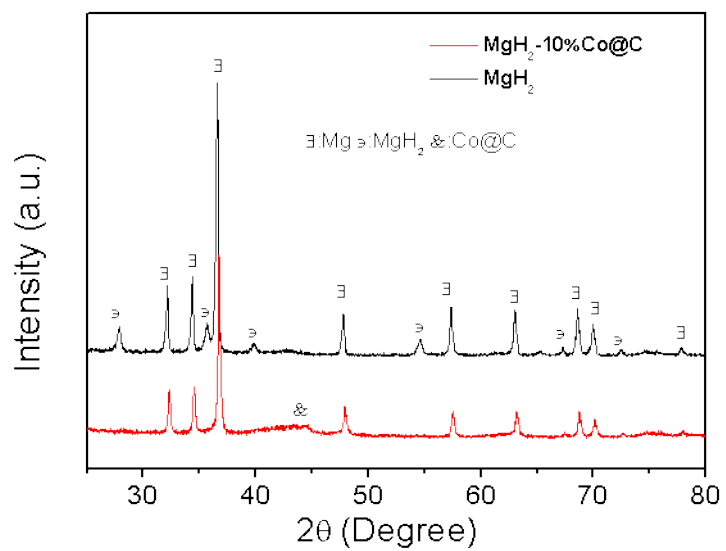**Supporting Information**

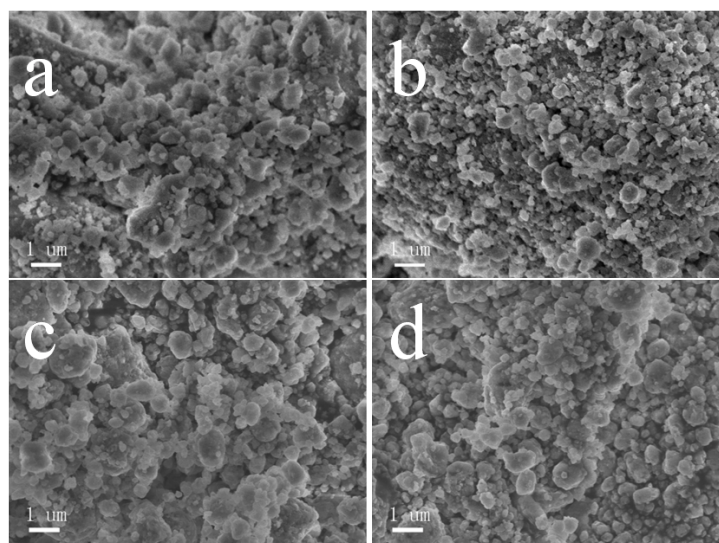
Figure S1 The representative DSC curves of pure MgH$_2$ and MgH$_2$-10%Co@C

samples (Ramp: 5 ^{o}C min^{-1}).

Table S1 Peak temperature and E_a for desorption of pure MgH_2 and MgH_2-10%Co@C samples.

Sample Name	Peak Temperature (°C)				E_a
	2 (°C min^{-1})	5 (°C min^{-1})	10 (°C min^{-1})	15 (°C min^{-1})	(kJ/mol)
MgH_2	340.7	359.3	374.5	380.6	157.1
MgH_2-10%Co@C	293.8	316.1	339.4	353.3	84.5

Figure S2 XRD images of pure MgH$_2$ and MgH$_2$-10%Co@C after dehydrogenation.

Figure S3 SEM images of pure MgH$_2$ and MgH$_2$-10%Co@C composites (a, b) as-milled, (c, d) after-dehydrogenated.