Fig. S1. Kissinger plots corresponding to H_2O (a), LT-H_2 (b), IT-H_2 (c) and HT-H_2 (d) desorption events. Full circles correspond to composites with $\chi_{Mg(OH)2}$=0.055, whereas open circles are from as received MgH_2 ($\chi_{Mg(OH)2}$=0.0045). It should be noted that the activation energies of the HT-H_2 desorption peak are similar for both samples (within ±2%).

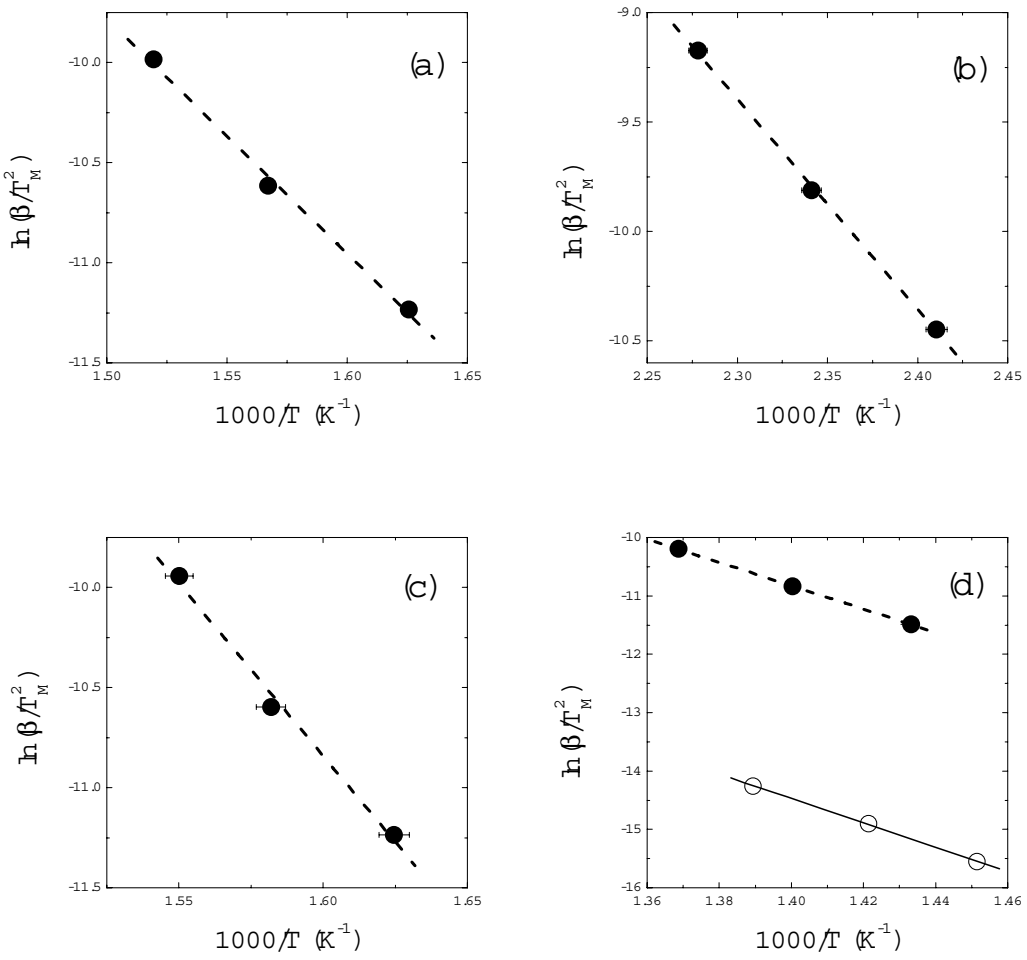

Table S1. Microstructural parameters (phase abundances, A; crystallite sizes, D; unit cell volumes, V) obtained from the Rietveld refinement of the XRD patterns shown in Fig.1. Data correspond to samples exposed to air for: (a) non-exposed material (as received MgH_2), (b) two hours, (c) two months, (d) four months.

	Phases											
	MgH_2			**$Mg(OH)_2$**			**Mg**			**MgO**		
Sample	A (wt%)	D (nm)	V(Å^3)	A (wt%)	D (nm)	V(Å^3)	A (wt%)	D (nm)	V(Å^3)	A (wt%)	D (nm)	V(Å^3)
a	88±6	>400	61.88	2±2	4	40.65	7±3	86	46.75	3±2	8	75.75
b	84		61.88	4	27	40.64	5	270	46.76	7	28	75.75
c	29		61.69	61	16	41.08	3	145	46.57	7	14	74.68
d	10		61.60	83	27	41.10	4	50	46.49	3	21	74.68