Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

CO_2 reutilization for methane production *via* catalytic process promoted by hydrides

María L. Grasso[a], Julián Puszkiel[a,b], Luisa Fernández Albanesi[a], Martin Dornheim[b], Claudio Pistidda[b] and Fabiana C. Gennari[*a]

[1]*Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET - Instituto Balseiro (UNCuyo and CNEA). Departamento Fisicoquímica de Materiales, Gerencia de Investigación Aplicada, Centro Atómico Bariloche (CNEA), R8402AGP, S. C. de Bariloche, Río Negro, Argentina*

[2] *Department of Nanotechnology, Institute of Materials Research, Helmholtz-Zentrum Geesthacht, 21502, Geesthacht, Germany.*

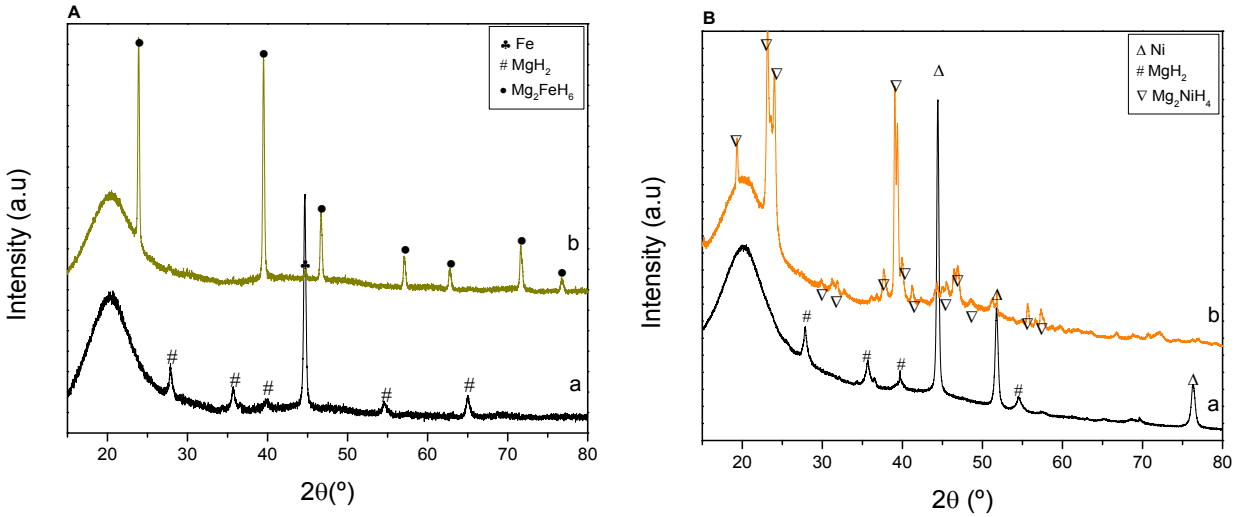

Figure S1: XRPD patterns of the $2MgH_2$-Fe (A) and $2MgH_2$-Ni (B) after milling for 5 h under 10 bar of hydrogen pressure (curve a); sintering at 450°C and 150 bars for 5 h (curve b).

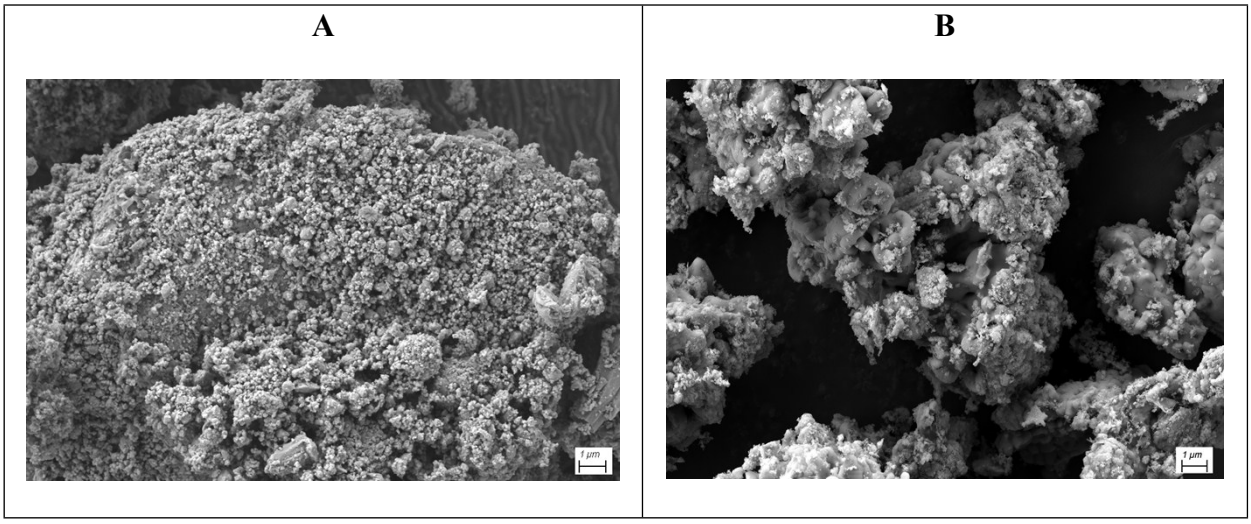

Figure S2: SEM photographs of as-synthesized Mg_2FeH_6 (A) and Mg_2NiH_4 (B) powders.

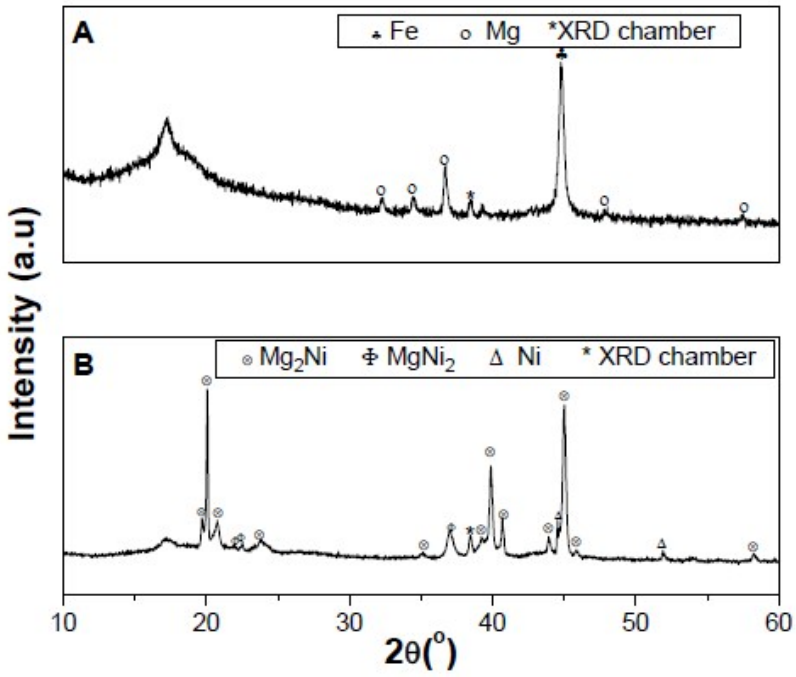

Figure S3: XRPD patterns of Mg_2FeH_6 (A) and Mg_2NiH_4 (B) after heating in He flow up to 500°C.

Ramp: 3 °C/min; flow of 50 cm^3/min.

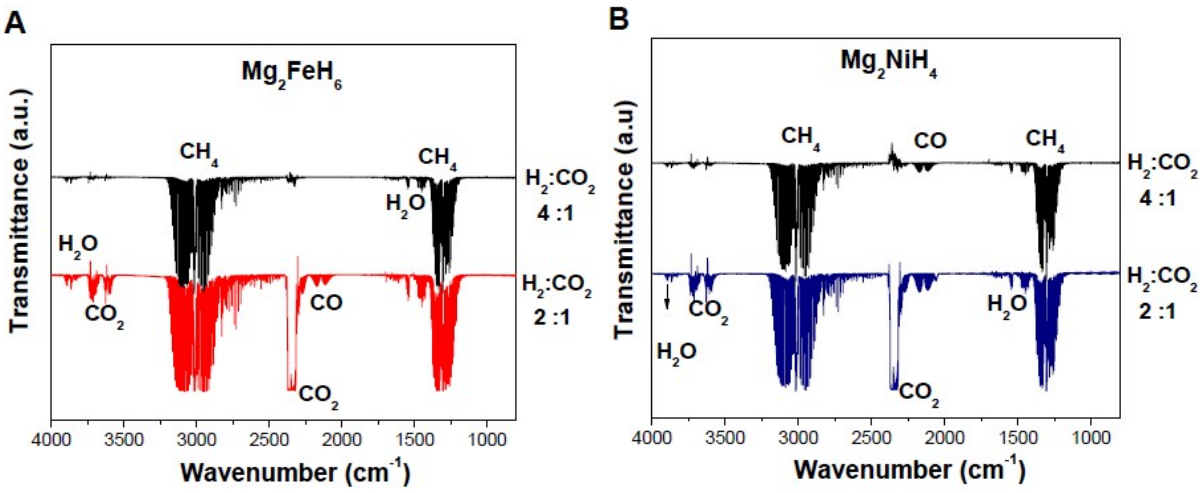

Figure S4: FTIR spectra of the gas products for the reaction between CO_2 and: A) Mg_2FeH_6; B) Mg_2NiH_4 at 400 °C for 5 h using different H_2:CO_2 mol ratio (4:1 and 2:1).

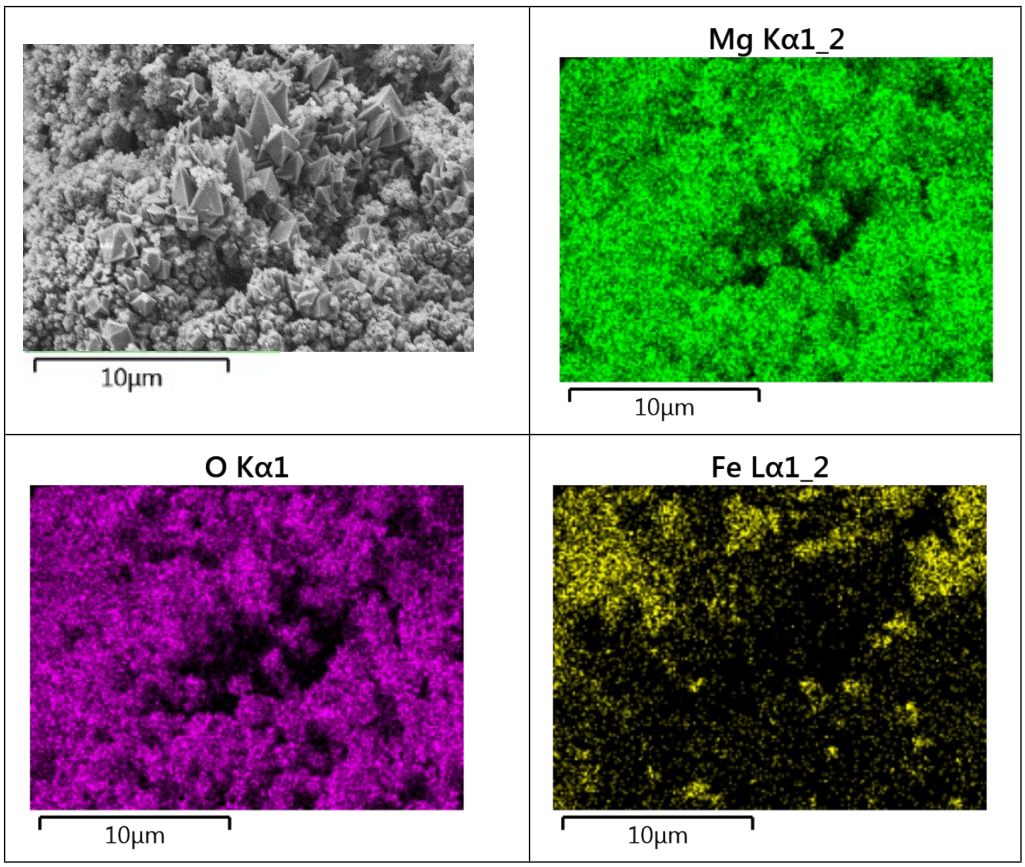

Figure S5: Detail of the faceted particles observed in the solid products after reaction between CO_2 and Mg_2FeH_6 at 400 °C for 10 h and EDS elemental mapping.

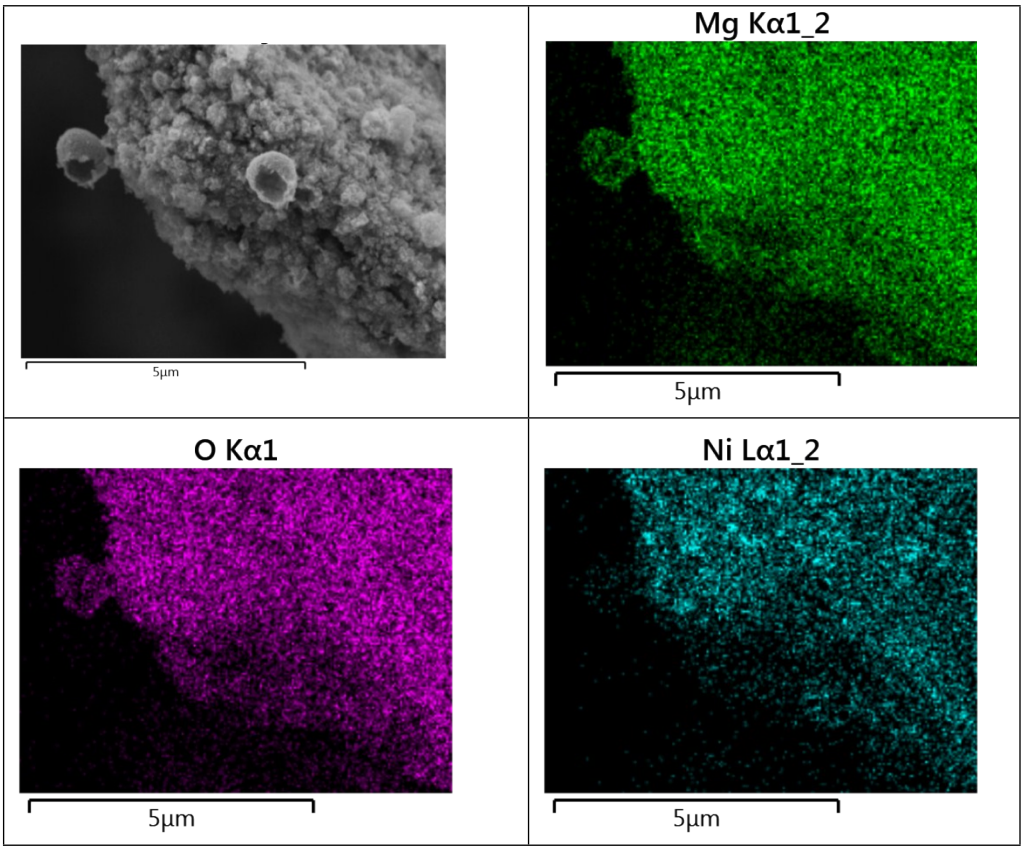

Figure S6: Detail of the spherical particles observed in the solid products after reaction between CO_2 and Mg_2NiH_4 at 400 °C for 10 h and EDS elemental mapping.

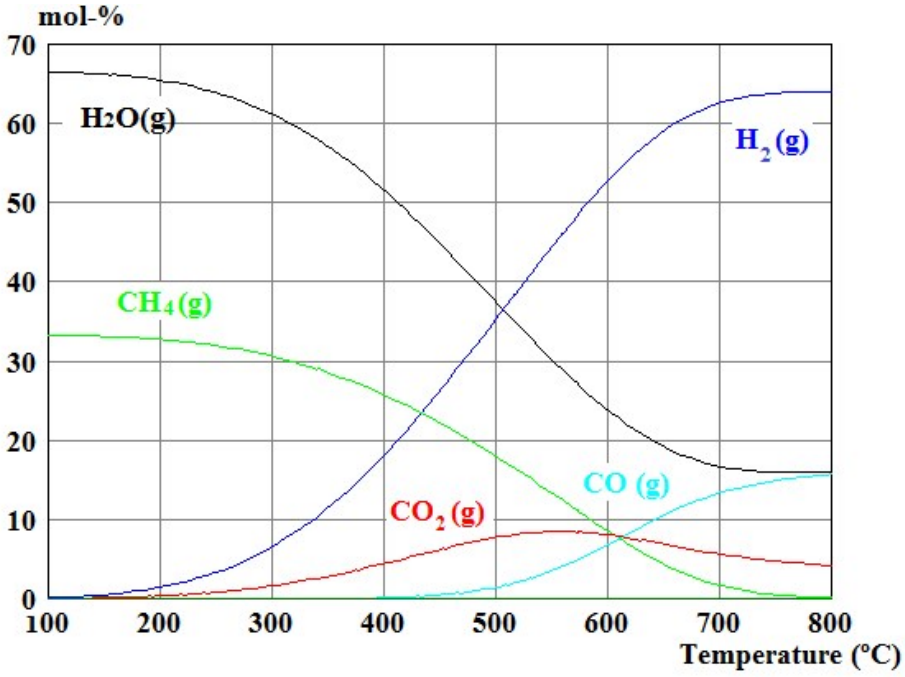

Fig. S7: Equilibrium composition of the CO_2-$4H_2$ system.