Supporting Information

Enhancing selectivity for semi-hydrogenation of Ni by periodic isolation in the MM'X structure

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Figures

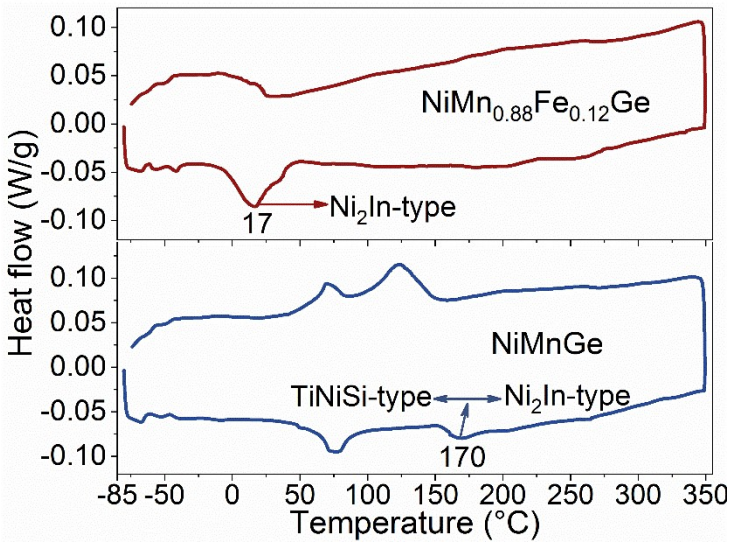

Fig. S1. DSC curves for NiMnGe and $NiMn_{0.88}Fe_{0.12}Ge$.

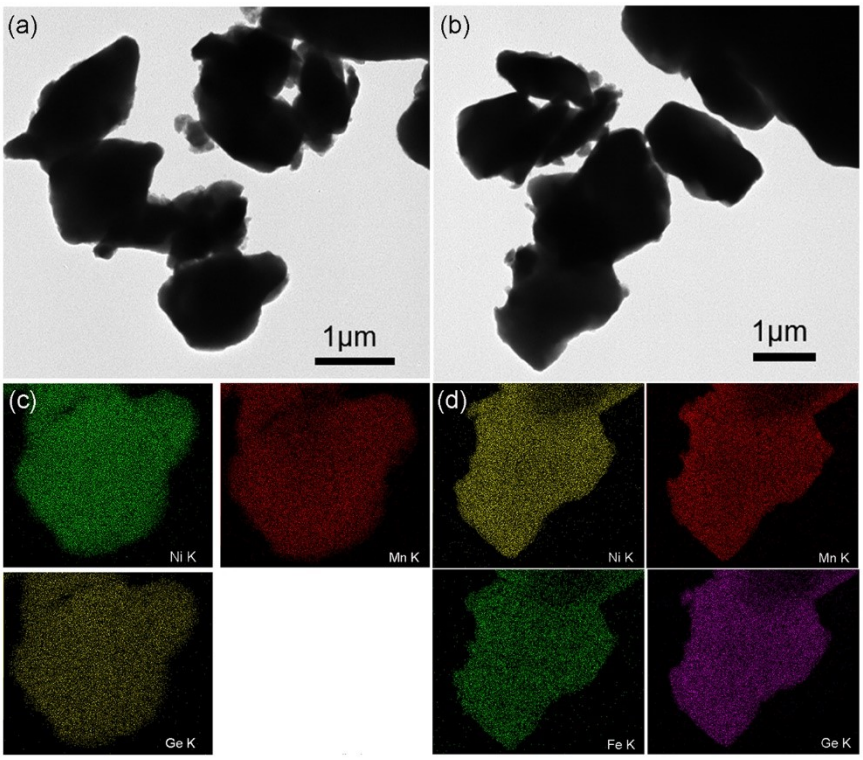

Fig. S2. TEM images of the NiMnGe (a) and $NiMn_{0.88}Fe_{0.12}Ge$ (b). The EDS mapping profiles of the NiMnGe (c) and $NiMn_{0.88}Fe_{0.12}Ge$ (d).

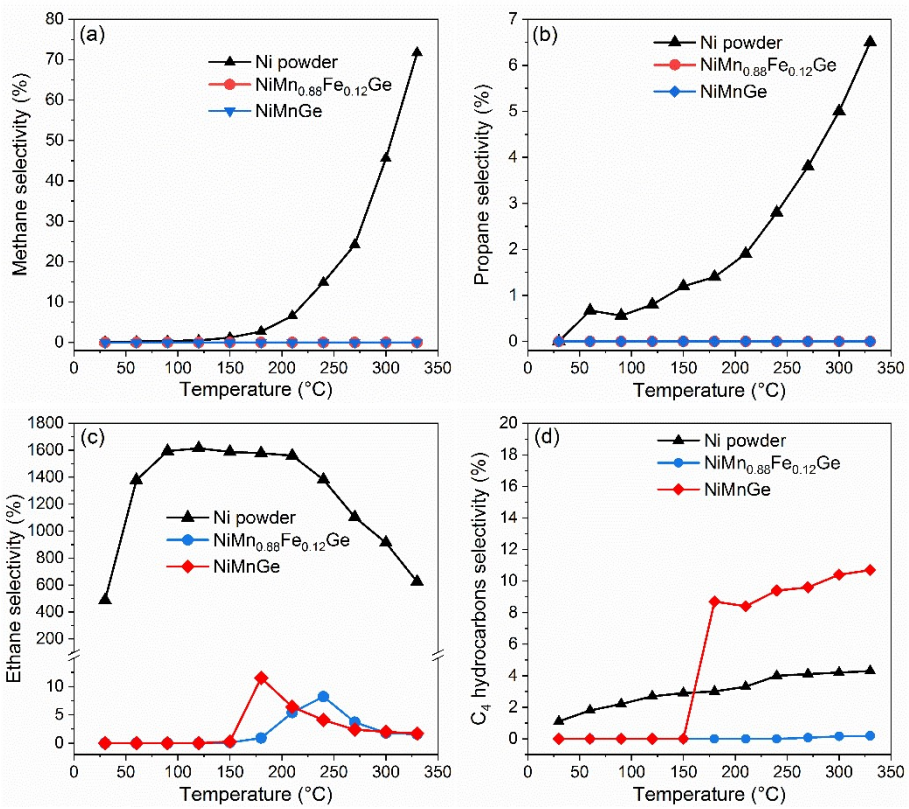

Fig. S3. Product selectivity on Ni and MM'X intermetallic compounds. (a) Methane; (b) Propane; (c) Ethane; (d) C_4 hydrocarbons.

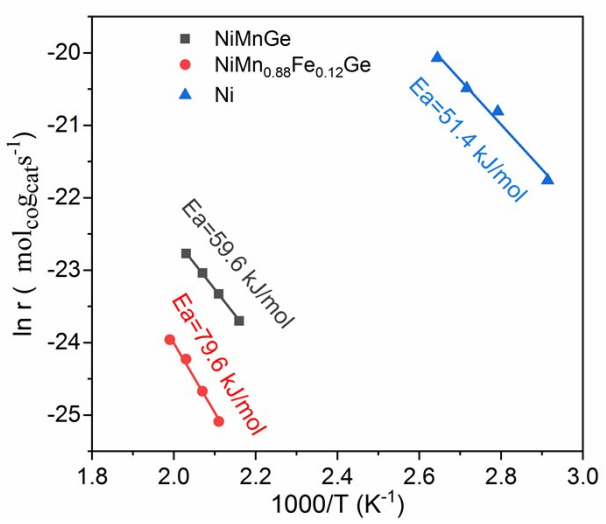

Fig. S4. Arrhenius plots over the Ni, NiMnGe, and $NiMn_{0.88}Fe_{0.12}Ge$ samples.

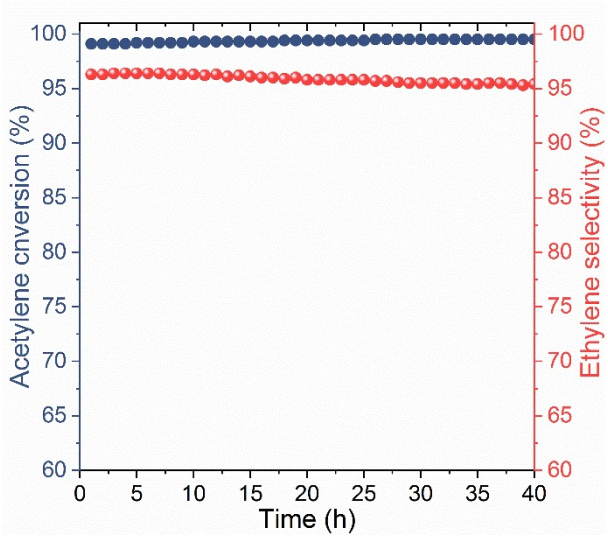

Fig. S5. Durability test on $NiMn_{0.88}Fe_{0.12}Ge$ at 270°C for 40 h (reaction condition: 1% C_2H_2, 20% H_2, 20% C_2H_4 gas mix balanced with Ar).

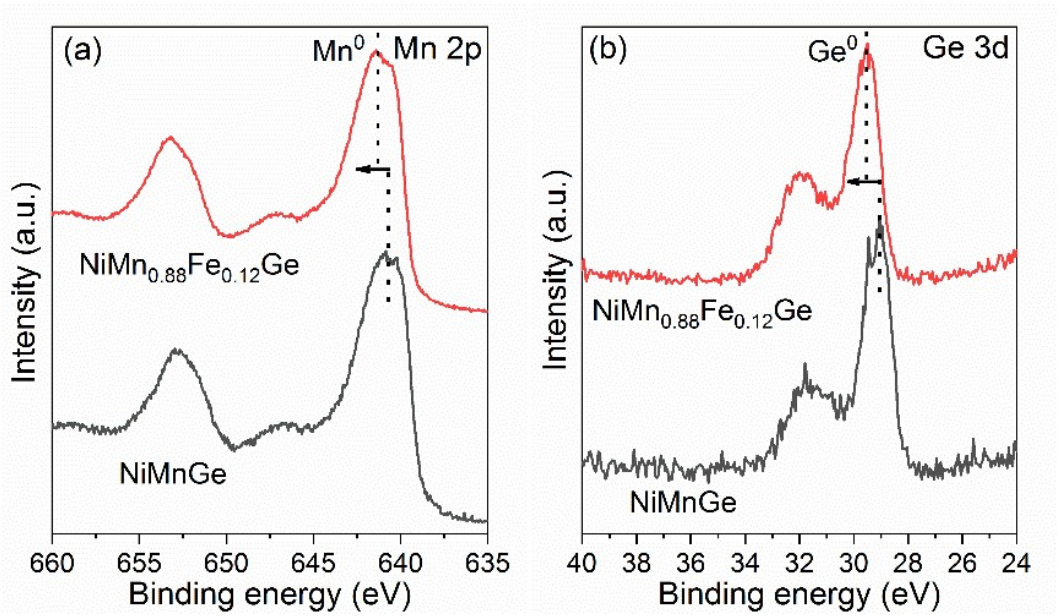

Fig. S6. XPS spectra of samples in (a) Mn 2p and (b) Ge 3d regions.

Table S1 Chemical compositions of the NiMnGe and $NiMn_{0.88}Fe_{0.12}Ge$ (atom.%) analyzed based on the EDS measurement.

Samples	Ni (atom%)	Mn (atom%)	Fe (atom%)	Ge (atom%)
NiMnGe	30.56	38.13	--	31.31
$NiMn_{0.88}Fe_{0.12}Ge$	32.45	28.69	5.37	33.49

Table S2 Catalysts in Figure 1d.

Catalysts	Ref	Catalysts	Ref
PdZn-1.8@ZIF	1	Pd-Ag/$MgCO_3$@α-Al_2O_3	2
Co_2FeGe	3	$Co_2FeGa_{0.25}Ge_{0.75}$	3
$CuPd_{0.006}/SiO_2$	4	Pd@S-Zn/Co-ZIF	5
Pd_1/C_3N_4	6	Pd NPs stabilized by CMC	7
0.005% Pd/$Ni(OH)_2$	8	Ni_3Sn	9
Ni_3Ga-MIHMs	10	ISA-Pd/MPNC	11
PdNPs/α-Al_2O_3	12	NiGa	13
Na-Ni@CHA	14	Pd/CTS	15
Ni/g-C_3N_4-T	16	0.05Pd-Cat-100/400	17
CN/Ni/Al_2O_3	18		

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