# SUPPLEMENTARY MATERIAL

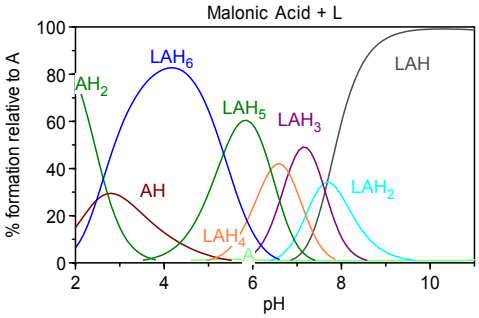


**Figure S1**. Speciation diagram for the interaction of **L** with malonic acid.

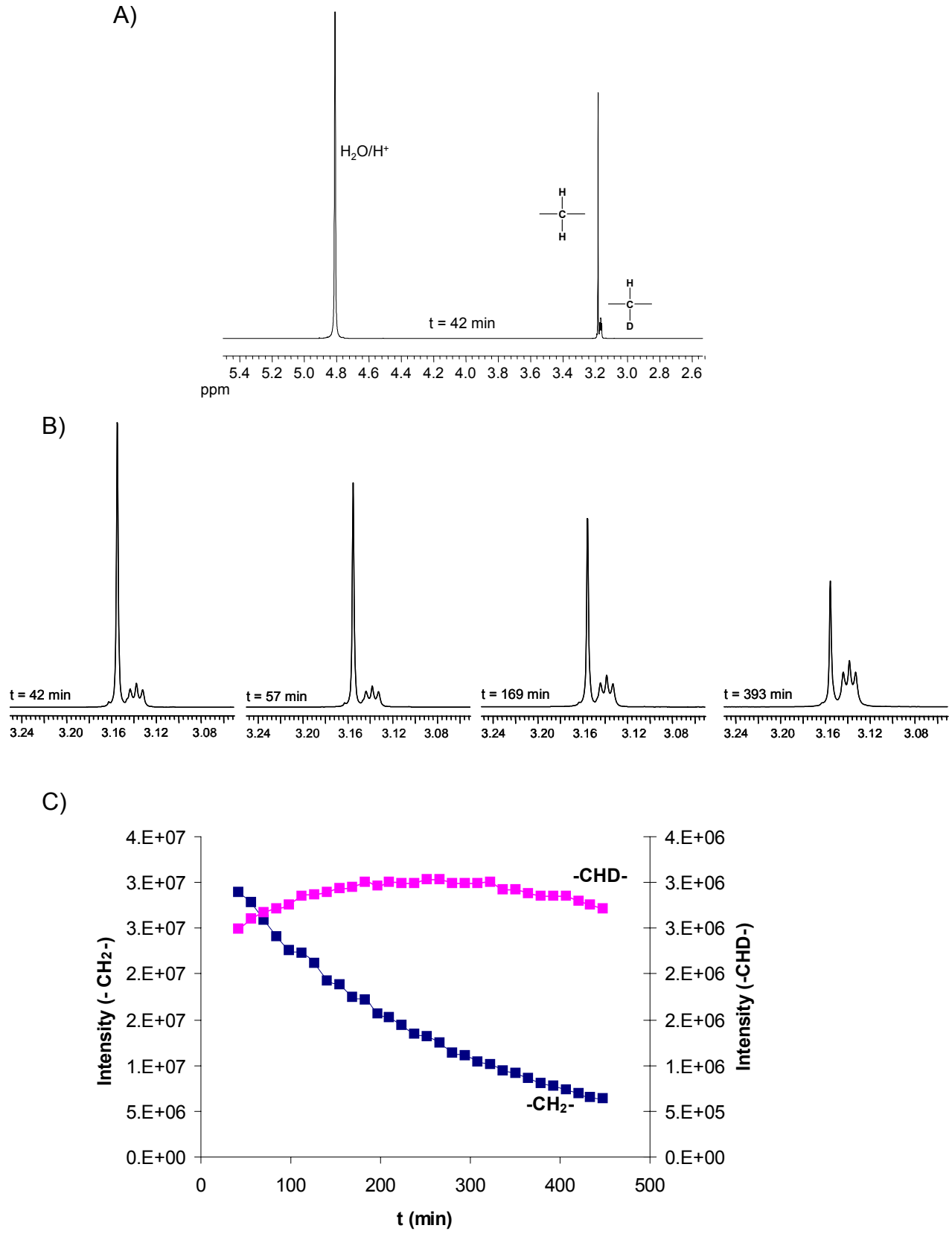


**Figure S2**. A) $^{1}$H NMR spectrum of malonic acid 0.1M at pD = 6, 25ºC; B) Change of the malonic peak at different times of reaction; C) plot of the intensities of $CH_2$ and CHD peaks against reaction time.

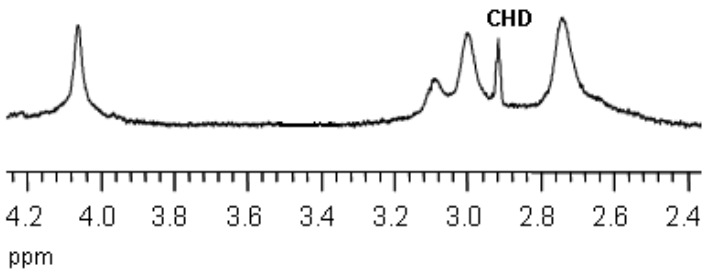


**Figure S3**. $^{1}$H NMR spectrum for the system **L-MA** at pD = 6 after two weeks of reaction. The presence of the peak **MA**-CHD (labelled as CHD) shows that the system works under reversible conditions.

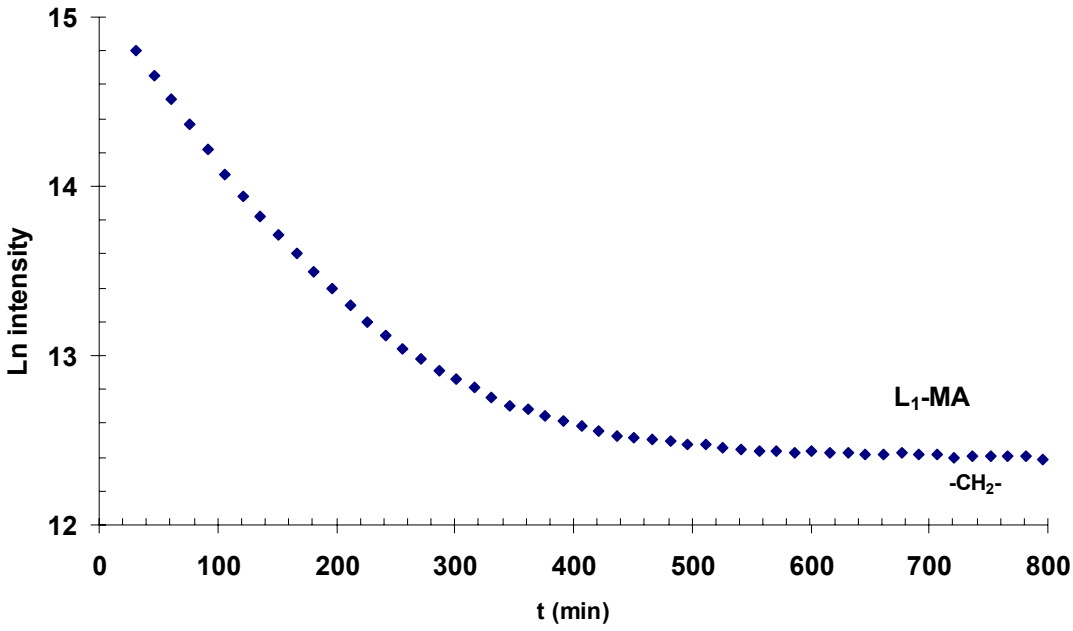


**Figure S4**. Plot of the Ln(intensity -$CH_2$-) *vs.* reaction time for the system **$L_1$-MA**.

**Table S1**. Calculated rate constants ($min^{-1}$) for the H/D exchange reaction of the $\alpha$-$CH_2$ catalysed by artificial receptors.

| Receptor | Substrate and conditions | $k_{obs}$ |
|---|---|---|
| Cyclodextrine[a] | *p-tert*-butylacetophenone pD = 5.95 | $0.12 \cdot 10^{-3}$ min |
| [24] ane $N_6O_2$[b] | Malonic acid pD = 7 | 0.105 $min^{-1}$ |
| [36] ane $N_8O_4$[b] | Malonic acid pD = 7 | 13.2 $min^{-1}$ |
| Cyclodextrines[c] | Malonate pD = 6.5 | $4.56 \cdot 10^{-2}$ $min^{-1}$ |
| | Pyruvate pD = 6.5 | $1.86 \cdot 10^{-2}$ - $9.6 \cdot 10^{-3}$ $min^{-1}$ |
| | Acetaldehyde pD = 6.5 | $1.02 \cdot 10^{-2}$ $min^{-1}$ |
| Cyclen Derivative [d] | Dihydroxyacetone phosphate pD = 7.0 | $2.8 \cdot 10^{-2}$ $min^{-1}$ |

[a] Taken from reference 6b
[b] Taken from reference 8b
[c] Taken from reference 7
[d] Taken from reference 12