# Supporting Information

## Catalytic hydrogen evolution performance of CoS$_x$ modified perovskite LaMnO$_3$ composites

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**Band potential calculation**

Pearson Absolute Electronegativity of different elements comes from the following database:

http://www.knowledgedoor.com/2/elements_handbook/pearson_absolute_electronegativity.html#opennewwindow?tdsourcetag=s_pcqq_aiomsg

CoWO$_4$:

$\chi = [\chi(Co) * \chi(W) * \chi(O)^4]^{1/6} = [\chi(4.30) * \chi(4.40) * \chi(7.54)^4]^{1/6} = 6.28$ eV

$E_g = 2.68$ eV

$E_{CB} = \chi - E^e - 0.5\,E_g = 6.28 - 4.5 - 0.5 * 2.68 = 0.44$ eV

$E_{VB} = E_{CB} + E_g = 3.12$ eV

CuNi$_2$S$_4$:

$\chi = [\chi(Cu) * \chi(Ni)^2 * \chi(S)^4]^{1/7} = [\chi(4.48) * \chi(4.40)^2 * \chi(6.22)^4]^{1/7} = 5.38$ eV

$E_g = 2.46$ eV

$E_{CB} = \chi - E^e - 0.5\ E_g = 5.38 - 4.5 - 0.5 * 2.46 = - 0.35$ eV

$E_{VB} = E_{CB} + E_g = 2.11$ eV