

Aluminium hydrides and borohydrides as reducing agents

Complex aluminium hydrides and borohydrides as reducing agents¹

The selective reduction of carbonyl groups and similar functionalities is amongst the most common synthetic transformations in organic chemistry.

Complex hydrides of boron and aluminium are very useful nucleophilic reducing reagents to accomplish these transformations for a wide number of substrates and with a broad range of selectivities and reactivities².

The reactivity, and therefore selectivity of the metal hydride is influenced by the following factors:

- Electronegativity of the central metal (Al < B)
- Lewis acidity of the counter ion
- Electron donating groups on the central metal
- Steric demand of both the reagent and the substrate
- Intrinsic polarity (electrophilicity) of the reducible functional group

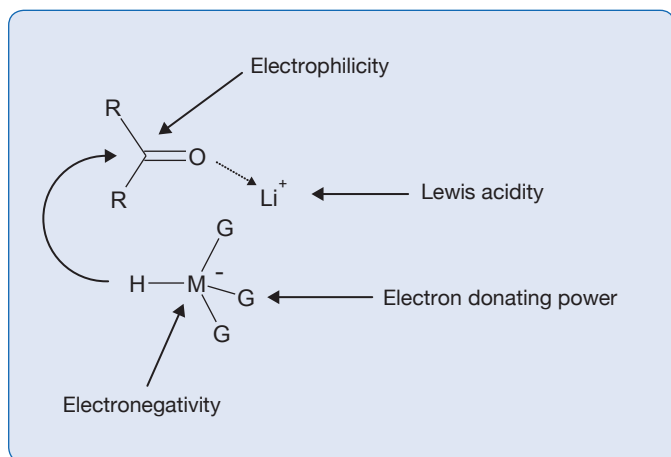


Figure 1 Factors affecting reactivity

The lower electronegativity of aluminium results in an increased electron density and therefore nucleophilicity of the hydride. The lithium cation is better able to act as a Lewis acid than sodium when interacting with a carbonyl oxygen. This induces a stronger polarity in the carbonyl group, enhancing the electrophilicity of the carbon. Both of these factors combine to make lithium aluminium hydride a more powerful reducing agent than sodium borohydride. Reactivity can be “tuned” further by altering the electron-donating and steric nature of the other groups bonded to the central metal (see Figure 2).

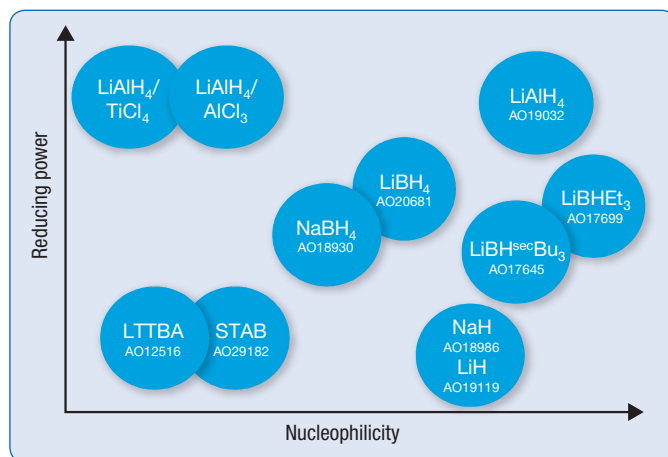
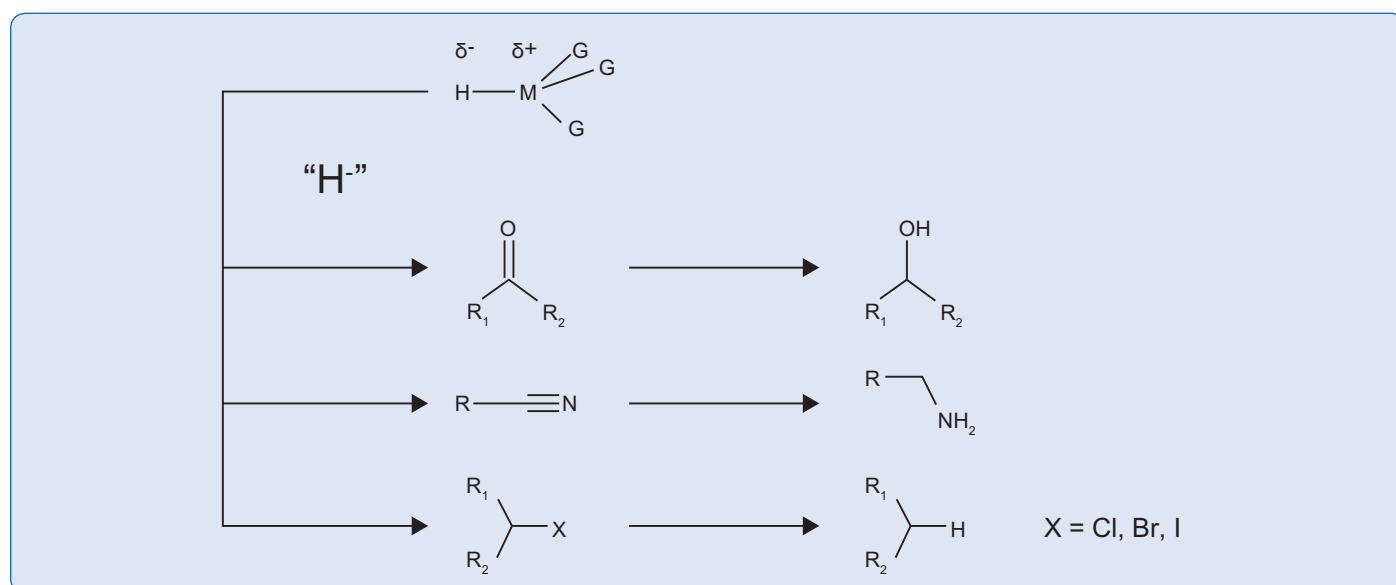


Figure 2 Reactivity “tuning” with complex metal hydrides

1. J.Seyden-Penne, Reductions by the Alumino- and Borohydrides in Organic Synthesis

2. N.M.Yoon, Pure.Appl. Chem. 68 (1996) 843.

The general reaction mechanism may be viewed as a nucleophilic attack of a hydride ion at a suitable functional group, as sketched in the following scheme:



Product Code	Aluminium and Boron hydride compounds			
AC376370050	Acros Organics	Benzyltriphenylphosphonium borohydride, 95%	5GR	18117-29-8
AC190320100			10GR	
AC190320250	Acros Organics	Lithium aluminium hydride, 95%, powder	25GR	16853-85-3
AC190321000			100GR	
AC190325000			500GR	
AC304530250	Acros Organics	Lithium aluminium hydride, 95%, tablets (ca. 0.6 g)	25GR	16853-85-3
AC304531000			100GR	
AC332100100	Acros Organics	Lithium aluminium hydride, 95%, in resealable tin cans	10GR	16853-85-3
AC332101000			100GR	
AC199511000	Acros Organics	Lithium aluminium hydride, 4.0M solution in diethyl ether, AcroSeal®	100ML	16853-85-3
AC199518000			800ML	
AC377321000	Acros Organics	Lithium aluminium hydride, 2.4M solution in THF, AcroSeal®	100ML	16853-85-3
AC377328000			800ML	
AC199491000	Acros Organics	Lithium aluminium hydride, 1M solution in THF, AcroSeal®	100ML	16853-85-3
AC199498000			800ML	
AC385571000	Acros Organics	Lithium aluminium hydride, 15% (3.5M) solution in toluene/THF, AcroSeal®	100ML	16853-85-3
AC385578000			800ML	
AC206810050			5GR	
AC206810100	Acros Organics	Lithium borohydride, 95%	10GR	16949-15-8
AC206810500			50GR	
AC428881000	Acros Organics	Lithium borohydride, 4M (10 wt.%) solution in THF, AcroSeal®	100ML	16949-15-8
AC428888000			800ML	
AC125160250	Acros Organics	Lithium tri-tert-butoxyaluminumhydride, 93-98%	25GR	17476-04-9
AC125161000			100GR	
AC377581000	Acros Organics	Lithium tri-tert-butoxyaluminumhydride, 1.1M solution in THF, AcroSeal®	100ML	17476-04-9
AC377588000			800ML	
AC176451000	Acros Organics	Lithium tri-sec-butylborohydride, 1M solution in THF, AcroSeal®	100ML	38721-52-7
AC176458000			800ML	

Product Code	Aluminium and Boron hydride compounds			
AC450691000	Acros Organics	Lithium triethylborohydride, 1.7M solution in THF, AcroSeal®	100ML	22560-16-3
AC450698000			800ML	
AC196550025	Acros Organics	Potassium borohydride, 98+%	2.5KG	13762-51-1
AC196550050			5GR	
AC196551000			100GR	
AC196555000			500GR	
AC205471000	Acros Organics	Potassium tri-sec-butylborohydride, 1M solution in tetrahydrofuran, AcroSeal®	100ML	54575-49-4
AC296020050	Acros Organics	Potassium tris(3,5-dimethyl-1-pyrazolyl)borohydride, 99%	5GR	17567-17-8
AC296010050	Acros Organics	Potassium tris(1-pyrazolyl)borohydride, 93%	5GR	18583-60-3
AC380110250	Acros Organics	Sodium aluminium hydride, 93%	25GR	13770-96-2
AC380111000			100GR	
AC187900500	Acros Organics	Sodium bis(2-methoxyethoxy)aluminium hydride, 70 wt% sol. in toluene (ca. 3.5M)	50GR	22722-98-1
AC187902500			250GR	
AC430911000	Acros Organics	Sodium bis(2-methoxyethoxy)aluminium hydride, 70 wt.% solution in toluene (ca. 3.5M), AcroSeal®	100ML	22722-98-1
AC430918000			800ML	
AC189300025	Acros Organics	Sodium borohydride, 98+%, powder	2.5KG	16940-66-2
AC189300050			5GR	
AC189300100			10GR	
AC189301000			100GR	
AC189305000			500GR	
AC200050250	Acros Organics	Sodium borohydride, 99%, powder	25GR	16940-66-2
AC200051000			100GR	
AC200055000			500GR	
AC201481000	Acros Organics	Sodium borohydride, 98%, pellets (1 cm)	100GR	16940-66-2
AC201485000			500GR	
AC419471000	Acros Organics	Sodium borohydride, 98%, granules, ca 3 mm	100GR	16940-66-2
AC419475000			500GR	
AC448480025	Acros Organics	Sodium borohydride, 99%, (VenPure™ SF powder), powder	2.5KG	16940-66-2
AC448481000			100GR	
AC448485000			500GR	
AC448491000	Acros Organics	Sodium borohydride, 99%, (VenPure™ AF caplets), caplets	100GR	16940-66-2
AC448495000			500GR	
AC448501000	Acros Organics	Sodium borohydride, 99%, (VenPure™ SF granules), granules	100GR	16940-66-2
AC448505000			500GR	
AC448521000	Acros Organics	Sodium borohydride, 20% aq. NaOH solution	100ML	16940-66-2
AC389930010	Acros Organics	Sodium borohydride, 12% solution in 40% aq. sodium hydroxide solution	1LT	16940-66-2
AC389930025			2.5LT	
AC389931000			100ML	
AC389932500			250ML	
AC429131000	Acros Organics	Sodium borohydride, 12% solution in 40% aq. NaOH solution, AcroSeal®	100ML	16940-66-2
AC448511000	Acros Organics	Sodium borohydride, (VenPure™ solution), 12% aq. solution	100ML	16940-66-2
AC448515000			500ML	
AC191131000	Acros Organics	Sodium borohydride, 0.5M solution in diglyme, AcroSeal®	100ML	16940-66-2
AC168550100	Acros Organics	Sodium cyanoborohydride, 95%	10GR	25895-60-7
AC168550500			50GR	
AC168552500			250GR	

Aluminium and Boron hydride compounds				
AC372451000	Acros Organics	Sodium cyanoborohydride, 1M solution in THF, AcroSeal	100ML	25895-60-7
AC372458000			800ML	
AC291820250	Acros Organics	Sodium triacetoxymborohydride, 97%	25GR	56553-60-7
AC291821000			100GR	
AC291825000			500GR	
AC200031000	Acros Organics	Sodium triethylborohydride, 1M solution in THF, AcroSeal	100ML	17979-81-6
AC212900100	Acros Organics	Tetrabutylammonium borohydride, 98%	10GR	33725-74-5
AC212900500			50GR	
AC392850100	Acros Organics	Tetramethylammonium triacetoxymborohydride, 90+%	10GR	109704-53-2
AC392850500			50GR	

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