

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

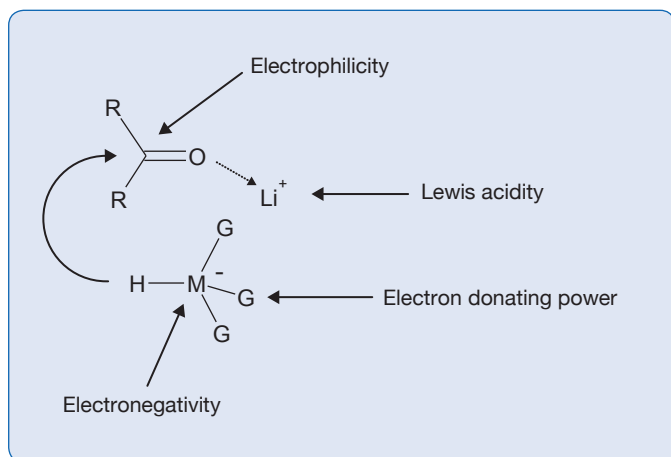


Figure 1 Factors affecting reactivity

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).

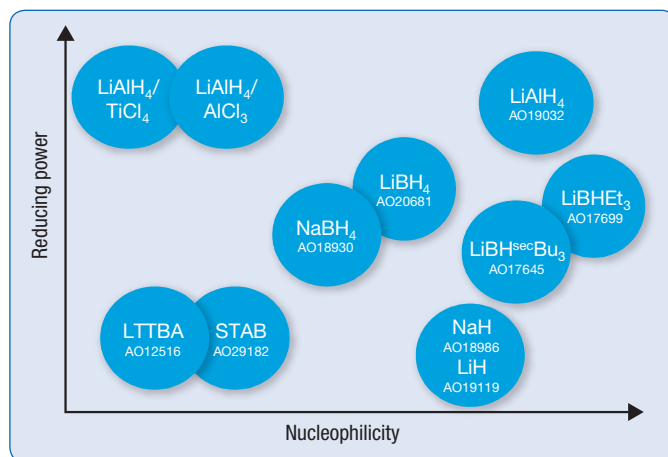
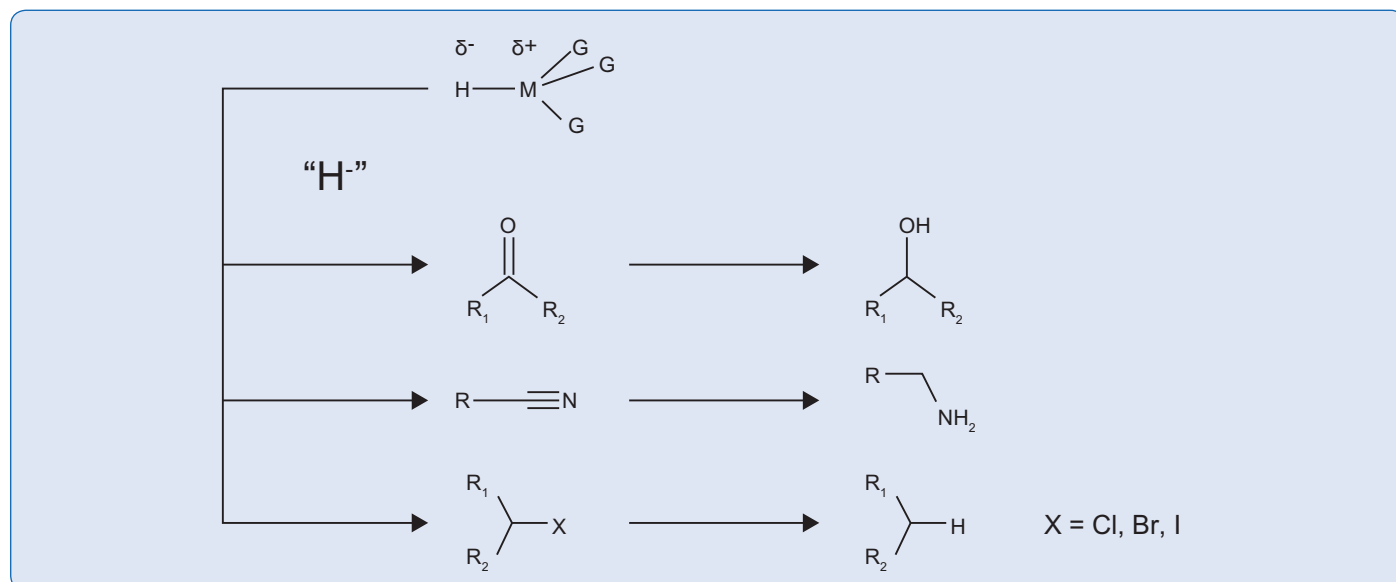


Figure 2 Reactivity “tuning” with complex metal hydrides

1. J.Seyden-Penne, Reductions by the Aluminio- 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:



Aluminium and Boron hydride compounds

Product code	Brand	Product name	Pack size	CAS no.
376370050	Acros Organics	Benzyltriphenylphosphonium borohydride, 95%	5GR	18117-29-8
376370250			25GR	
190320100	Acros Organics	Lithium aluminium hydride, 95%, powder	10GR	16853-85-3
190320250			25GR	
190321000			100GR	
190325000			500GR	
304530250	Acros Organics	Lithium aluminium hydride, 95%, tablets (ca. 0.6 g)	25GR	16853-85-3
304531000			100GR	
332100100	Acros Organics	Lithium aluminium hydride, 95%, in resealable tin cans	10GR	16853-85-3
332101000			100GR	
A/2160/45	Acros Organics	Aluminium lithium hydride, 95+%, pure	10GR	16853-85-3
199511000	Acros Organics	Lithium aluminium hydride, 4.0M solution in diethyl ether, AcroSeal®	100ML	16853-85-3
199518000			800ML	
377321000	Acros Organics	Lithium aluminium hydride, 2.4M solution in THF, AcroSeal®	100ML	16853-85-3
377328000			800ML	
199491000	Acros Organics	Lithium aluminium hydride, 1M solution in THF, AcroSeal®	100ML	16853-85-3
199498000			800ML	
385571000	Acros Organics	Lithium aluminium hydride, 15% (3.5M) solution in toluene/THF, AcroSeal®	100ML	16853-85-3
385578000			800ML	
434551000	Acros Organics	Lithium aluminium hydride bis(tetrahydrofuran), 1M solution in toluene, AcroSeal®	100ML	123439-81-6
434558000			800ML	
206810050	Acros Organics	Lithium borohydride, 95%	5GR	16949-15-8
206810100			10GR	
206810500			50GR	
428881000	Acros Organics	Lithium borohydride, 4M (10 wt.%) solution in THF, AcroSeal®	100ML	16949-15-8
428888000			800ML	
433491000	Acros Organics	Lithium morpholinoborohydride, 1M solution in THF, AcroSeal®	100ML	144240-18-6
125160250	Acros Organics	Lithium tri-tert-butoxyaluminumhydride, 93-98%	25GR	17476-04-9
125161000			100GR	
125165000			500GR	
377581000	Acros Organics	Lithium tri-tert-butoxyaluminumhydride, 1.1M solution in THF, AcroSeal®	100ML	17476-04-9
377588000			800ML	
176451000	Acros Organics	Lithium tri-sec-butylborohydride, 1M solution in THF, AcroSeal®	100ML	38721-52-7
176458000			800ML	

Aluminium and Boron hydride compounds

Product code	Brand	Product name	Pack size	CAS no.
450691000	Acros Organics	Lithium triethylborohydride, 1.7M solution in THF, AcroSeal®	100ML	22560-16-3
450698000			800ML	
439111000	Acros Organics	Lithium tris[(3-ethyl-3-pentyl)oxy]aluminumhydride, 0.5M solution in THF, AcroSeal®	100ML	79172-99-9
439118000			800ML	
196550025	Acros Organics	Potassium borohydride, 98+%	2.5KG	13762-51-1
196550050			5GR	
196551000			100GR	
196555000			500GR	
205471000	Acros Organics	Potassium tri-sec-butylborohydride, 1M solution in tetrahydrofuran, AcroSeal®	100ML	54575-49-4
205478000			800ML	
296020050	Acros Organics	Potassium tris(3,5-dimethyl-1-pyrazolyl)borohydride, 99%	5GR	17567-17-8
296010050	Acros Organics	Potassium tris(1-pyrazolyl)borohydride, 93%	5GR	18583-60-3
380110250	Acros Organics	Sodium aluminium hydride, 93%	25GR	13770-96-2
380111000			100GR	
380115000			500GR	
187900010			1KG	
187900500	Acros Organics	Sodium bis(2-methoxyethoxy)aluminium hydride, 70 wt% sol. in toluene (ca. 3.5M)	50GR	22722-98-1
187902500			250GR	
430911000	Acros Organics	Sodium bis(2-methoxyethoxy)aluminium hydride, 70 wt.% solution in toluene (ca. 3.5M), AcroSeal®	100ML	22722-98-1
430918000			800ML	
189300025	Acros Organics	Sodium borohydride, 98+%, powder	2.5KG	16940-66-2
189300050			5GR	
189300100			10GR	
189301000			100GR	
189305000			500GR	
200050250	Acros Organics	Sodium borohydride, 99%, powder	25GR	16940-66-2
200051000			100GR	
200055000			500GR	
201480025	Acros Organics	Sodium borohydride, 98%, pellets (1 cm)	2.5KG	16940-66-2
201481000			100GR	
201485000			500GR	
419471000	Acros Organics	Sodium borohydride, 98%, granules, ca 3 mm	100GR	16940-66-2
419475000			500GR	
448480025	Acros Organics	Sodium borohydride, 99%, (VenPure™ SF powder), powder	2.5KG	16940-66-2
448480100			10KG	
448481000			100GR	
448485000			500GR	
448490025	Acros Organics	Sodium borohydride, 99%, (VenPure™ AF caplets), caplets	2.5KG	16940-66-2
448490100			10KG	
448491000			100GR	
448495000			500GR	
448500025	Acros Organics	Sodium borohydride, 99%, (VenPure™ SF granules), granules	2.5KG	16940-66-2
448500100			10KG	
448501000			100GR	
448505000			500GR	
S/2560/45	Fisher Chemical	Sodium borohydride, technical, SLR	10GR	16940-66-2
S/2560/46			25GR	
S/2560/48			100GR	
448520025	Acros Organics	Sodium borohydride, 20% aq. NaOH solution	2.5LT	16940-66-2
448521000			100ML	
448525000			500ML	
389930010	Acros Organics	Sodium borohydride, 12% solution in 40% aq. sodium hydroxide solution	1LT	16940-66-2
389930025			2.5LT	
389931000			100ML	
389932500			250ML	
429131000	Acros Organics	Sodium borohydride, 12% solution in 40% aq. NaOH solution, AcroSeal®	100ML	16940-66-2
448510025	Acros Organics	Sodium borohydride, (VenPure™ solution), 12% aq. solution	2.5LT	16940-66-2
448511000			100ML	
448515000			500ML	
191131000	Acros Organics	Sodium borohydride, 0.5M solution in diglyme, AcroSeal®	100ML	16940-66-2

Aluminium and Boron hydride compounds

Product code	Brand	Product name	Pack size	CAS no.
168550100			10GR	
168550500	Acros Organics	Sodium cyanoborohydride, 95%	50GR	25895-60-7
168552500			250GR	
372451000	Acros Organics	Sodium cyanoborohydride, 1M solution in THF, AcroSeal®	100ML	25895-60-7
372458000			800ML	
291820250			25GR	
291821000	Acros Organics	Sodium triacetoxyborohydride, 97%	100GR	56553-60-7
291825000			500GR	
200031000	Acros Organics	Sodium triethylborohydride, 1M solution in THF, AcroSeal®	100ML	17979-81-6
200038000			800ML	
212900100	Acros Organics	Tetrabutylammonium borohydride, 98%	10GR	33725-74-5
212900500			50GR	
392850100	Acros Organics	Tetramethylammonium triacetoxyborohydride, 90+%	10GR	109704-53-2
392850500			50GR	

If you would like to know more about our extensive range of aluminium hydrides and borohydrides, download the full product brochure from www.acros.com or scan the QR code with your smartphone or tablet.



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