

Contents

1. Introduction	7
2. Methods for Reduction of P=O Bond	11
2.1. Reduction of P=O with Alkali Metals Hydrides	11
2.1.1. LiAlH_4	11
2.1.2. AlH_3 (alane)	17
2.1.3. AlHCl_2	22
2.1.4. Amino-alanes	24
2.1.5. $\text{NaAlH}_2(\text{OC}_2\text{H}_4\text{OCH}_3)_2$ (Red-Al)	24
2.1.6. $(i\text{-Bu})_2\text{AlH}$ (DIBAL-H)	25
2.1.7. Alkali metal hydrides	28
2.2. Reduction of P=O Bond by Means of Metal Complexes	29
2.3. Reduction of P=O Bond Using Silyl Compounds	31
2.3.1. PhSiH_3	31
2.3.2. Ph_2SiH_2	34
2.3.3. Ph_3SiH	35
2.3.4. PHMS	36
2.3.5. HSiCl_3	38
2.3.6. Si_2Cl_6	43

2.3.7. 1,3-Diphenyldisiloxane (DPDS)	45
2.3.8. Disilanes	46
2.4. Reduction of P=O Bond with the Participation of Catalytic Amounts of Lewis Acid or Bronsted Acid	47
2.4.1. (EtO) ₃ SiH/Ti(Oi-Pr) ₄	47
2.4.2. TMDS/Lewis acid	49
2.4.3. (EtO) ₂ MeSiH/Bronsted acid	52
2.4.4. PhSiH ₃ or Ph ₂ SiH ₂ /Lewis acid or Bronsted acid	54
2.4.5. 1,3-Diphenyldisiloxane (DPDS)/Bronsted acid	57
2.4.6. Hexylsilane (HexSiH ₃)/Bronsted acid	58
2.5. The Use of Boron Compounds Reagents as Reducing Agents for P=O Bond	58
2.5.1. Organoboron compounds	59
2.5.2. NaBH ₄	61
2.5.3. LiBH ₄ and L-selectride (lithium tri-sec-butylborohydride)	62
2.5.4. BH ₃ complexes	63
2.6. Indirect Methods for Reduction of P=O Bond	85
2.6.1. Reduction of phosphonium chlorides with reducing agents	85
2.6.2. Electrochemical methods for reduction of P=O bonds	87
2.6.3. Reduction of phosphonium alkoxy derivatives with reducing agents	87
2.6.4. Bronsted acid promoted reduction of tertiary phosphines oxides	88
2.7. Other Methods	89
3. Conclusions	91
4. List of Abbreviations	93
5. References	95