



Varying the amount of **2a** gave a change in product distribution. With 1 mmol of **2a**, only **5a** was obtained, while **3a** was obtained selectively with 5.5 or 10 mmol of **2a**. Using 2-5 mmol of **2a**, a mixture of **3a** and **5a** was obtained. This suggests that either **3a** or **5a** can be synthesized selectively by changing the ratio of **2a** to hydrogenated **1**.<sup>6)</sup>

Hydrogenation of 4-substituted biphenyls (**2b-d**) was also investigated. In the case of 4-methoxybiphenyl (**2b**), reaction did not take place. With 4-methylbiphenyl (**2c**), conversion was lower than that of **2a** and the yield of **3c** was slightly higher than that of **4c**. These results indicate that electron donating groups retard the reaction, that is, hydrogen in **1** attacks the substrates nucleophilically. The reaction of 4-bromobiphenyl (**2d**) gave **2a** in 95% and further hydrogenation did not take place. This is probably due to deterioration of **1** by hydrobromic acid that evolves from **2d** as the reaction proceeds.

1,2-Diphenylethane and diphenylmethane (1 mmol) also could be hydrogenated to give dodecahydrogenated derivatives in 88 and 67% yield, respectively, along with the hexahydrogenated ones (11 and 8 %).

Further investigation concerning scope and limitation of the reaction and its mechanism is now in progress.

Table 1. Hydrogenation of biphenyl derivatives with the hydrogen storage alloy<sup>a)</sup>

Substrate	Temp	Conv. of (2) / % <sup>b)</sup>	Yield / % <sup>b)</sup>			H <sub>2</sub> introduced mmol <sup>c)</sup>
	°C		(3)	(4)	(5)	
<b>2a</b> (10 mmol)	120	5	4	-	d)	1.2
<b>2a</b> (10 mmol)	140	27	26	-	-	7.8
<b>2a</b> (10 mmol)	160	42	41	-	-	12.3
<b>2a</b> (10 mmol)	180	56	42	-	-	12.6
<b>2a</b> (1 mmol)	160	98	-	-	95	5.6
<b>2a</b> (2 mmol)	160	99	7	-	89	11.0
<b>2a</b> (3 mmol)	160	98	48	-	41	11.4
<b>2a</b> (5 mmol)	160	95	83	-	11	14.9
<b>2a</b> (5.5 mmol)	160	95	90	-	4	16.2
<b>2b</b> (5 mmol)	160	0	-	-	-	-
<b>2c</b> (5 mmol) <sup>f)</sup>	160	37	21	15 <sup>e)</sup>	-	3.3
<b>2d</b> (5 mmol) <sup>f)</sup>	160	99	-	-	-	-

a) Reaction was carried out for 3 h under nitrogen with the room-temperature pressure of 5 kg·cm<sup>-2</sup>.

b) Determined by GLC analysis. c) Calculated from the yield of products. d) Not detected. e) **4c** was obtained as a mixture of *trans*- and *cis*-isomers. f) **2a** was obtained in 95% yield.

#### References

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- 5) T. Sakai, T. Hazama, H. Miyamura, N. Kuriyama, A. Kato, and H. Ishikawa, *J. Less-Common Met.*, **172/174**, 1175 (1991).
- 6) Hydrogenation of biphenyl to cyclohexylbenzene using catalysts such as Pd, Pt, and Ni was also reported. However, when these catalysts were used, the selectivity for the formation of cyclohexylbenzene was generally not so high at higher conversion of biphenyl: for example, see H. A. Smith, D. M. Alderman, Jr., C. D. Shacklett, and C. M. Welch., *J. Am. Chem. Soc.*, **71**, 3772 (1949).

(Received November 8, 1993)