

## Communications

### Selective Deprotection of Dimethyl Acetal and Ketal Using Allyl Bromide in Aqueous Media

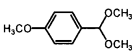
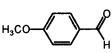
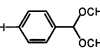

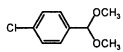

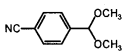

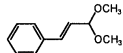

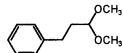

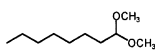
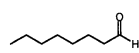
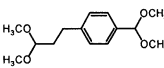
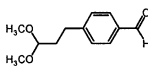


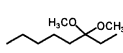
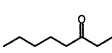
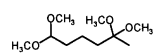
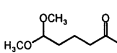
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Received March 4, 2000

A number of cleavage reactions of dimethyl acetals or ketals, which are useful protecting groups of carbonyl, have been reported.<sup>1</sup> However, most of these reactions lack chemoselectivity except a few cases.<sup>2</sup> Herein we report convenient deketalization and chemoselective deacetalization reactions by allyl bromide in aqueous media.

While working on metal catalyzed allylation reactions of acetals and ketals, we found that benzaldehyde dimethyl acetal could be deacetalized by allyl bromide in aqueous media. Cleavage reactions of various dimethyl acetals and ketals were carried out with 1.5–3.0 equiv of allyl bromide in aqueous THF (H<sub>2</sub>O/THF = 3/1, v/v) at rt for 1.5–5h.<sup>3</sup> The results are summarized in Table 1. The reaction rate of benzaldehyde dimethyl acetals (Entry 1, 2, 3 and 4) was highly dependent upon the nature of substituents of the phenyl group.<sup>4</sup> Electron-donating groups facilitated the deprotection reaction and electron-withdrawing groups retarded the reaction rate. In the case of 4-cyanobenzaldehyde dimethyl acetal, even no reaction proceeded in 3h. A dimethyl acetal connected to a phenyl group through a conjugated carbon-carbon double bond (Entry 5) was also converted to the corresponding aldehyde quantitatively under the same reaction condition. However, the acetals of aliphatic aldehydes (Entry 6 and 7) were inert to the reaction condition. On the other hand, aliphatic ketals of cyclic and acyclic ketones (Entry 9 and 10) smoothly underwent the deprotection reaction to afford the corresponding ketones in good to excellent yields. Combining these results, we could perform a chemoselective deacetalization. The compound having both aromatic and aliphatic acetals (Entry 8) was subjected to the reaction condition and, as expected, only the aromatic acetal was deprotected in 94% yield leaving the aliphatic one intact. Likewise, the selective deprotection of aliphatic ketal in the presence of aliphatic acetal could be realized (Entry 11). Attempted

**Table 1.** Deprotection of Acetals and Ketals by Allyl Bromide in Aqueous Media<sup>a</sup>

Entry	Substrate	Product	Time (h)	Yield (%) <sup>b</sup>
1			3	100
2			3	100(100) <sup>d</sup>
3			3	21(99) <sup>d</sup>
4			3	nr
5			3	100
6			3	nr
7			4	nr(49) <sup>d</sup>
8			4	94
9			5	98(98) <sup>d</sup>
10			1.5	84
11			1	95 <sup>c</sup>

<sup>a</sup>All reactions were carried out in 0.2–0.4 mmol scale at rt. <sup>b</sup>Isolated yield <sup>c</sup>Determined by capillary GC <sup>d</sup>using a small amount of aqueous HBr.

selective deprotection by applying aqueous HBr directly was unsatisfactory. Optimization of the reaction condition including the amount of HBr needed was tricky and even hardly attainable. We consider that allyl bromide in aqueous solution is a good and convenient source of generating HBr in

the amount appropriate for the chemoselective deprotection.

In summary, allyl bromide in aqueous media provides a recommendable way of cleaving dimethyl acetals and ketals for its nature of easy handling, simple procedure and selectivity.

**Acknowledgment.** We are grateful to the Korea Ministry of Science and Technology for financial support.

### References

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  2. (a) Evans, D. A.; Tanis, S. P.; Hart, D. J. *J. Am. Chem. Soc.* **1981**, *103*, 5813. (b) Stern, A. J.; Swenton, J. S. *J. Org. Chem.* **1989**, *54*, 2953.
  3. Typical reaction procedure is as follows; [4-(3,3-dimethoxypropyl)phenyl]dimethoxymethane (Entry 8, 0.3 mmol) was dissolved in water (0.9 mL) and THF (0.3 mL), followed by the addition of allyl bromide (0.9 mmol) at room temperature. The reaction mixture was stirred for 4h, filtered through celite and washed with ethyl acetate. After a usual workup and purification by column chromatography on silica gel yielded 4-(3,3-dimethoxypropyl)benzaldehyde (0.28 mmol, 94%) as a colorless oil.
  4. In the series of cyclic acetals (2-phenyl-1,3-dioxane and 2-phenyl-1,3-dithiolane), no reaction preceded under the same reaction condition.
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