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Efficient Procedure for the Preparation of (Vinyl)polystyrene Resin

Catherine Sylvain, Alain Wagner, Charles Mioskowski*

Laboratoire de Synthèse Bioorganique, Université Louis Pasteur de Strasbourg, UMR 7514
Faculté de Pharmacie, 74 route du Rhin – F-67401 Illkirch, France[#].

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Abstract: (Vinyl)polystyrene resin is prepared in one step by treatment of Merrifield resin with an excess dimethylsulfonium methylide. © 1998 Elsevier Science Ltd. All rights reserved.

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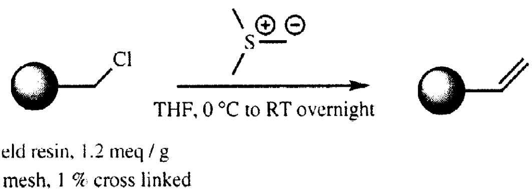
Substrates tethered to Merrifield resin through benzylic bonds, are often subject to unwanted cleavage under various reaction conditions. In contrast, functional polymers that incorporate ethylene (dimethylene) spacers are stable and therefore more versatile. In addition such spacer move the functional groups away from the polymer backbone conferring more mobility and accessibility to the system. However the preparation of these resins has so far required many steps and the use of toxic and/or expensive chemicals[1].

Recently, (vinyl)polystyrene was described to be a useful precursor for the preparation of many homobenzylic functionalized resins[2]. Indeed, such resins can be converted into polystyrene-linked homobenzyl -alcohol, -bromide, -amine and -chlorodimethylsilane.

Darling and al., who reported these transformations, used highly cross-linked microporous (vinyl)polystyrene beads. These resins were prepared by free radical suspension copolymerization of divinylbenzene with styrenic monomers in the presence of porogen and suspending agents. However the reported procedure is difficult to carry out because it involves complex polymerization processes, and furthermore, result in resins that are very different in terms of physical properties from those usually used in solid phase synthesis.

Herein we report a simple and efficient one pot procedure for the synthesis of (vinyl)polystyrene from commercially available Merrifield resin (scheme 1).



Scheme 1

[#] : Email address : mioskow@aspirine.u-strasbg.fr

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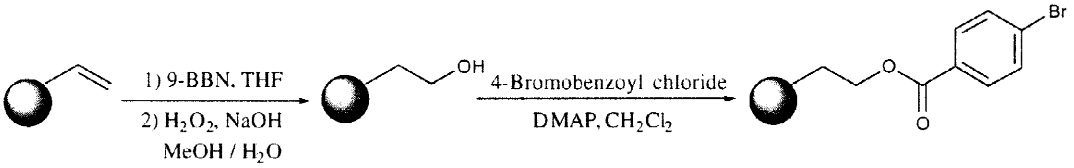
Chloromethyl polystyrene is reacted with an excess of dimethylsulfonium methylide in THF to yield the desired (vinyl)polystyrene resin[3]. After throughout washing, the resin is dried under vacuum and IR analysis showed characteristic absorptions bands at 1628, 988, 903, 837 cm^{-1}.

The efficiency of this process was confirmed by treatment of the (vinyl)resin with 9-BBN followed by oxidative work up. The resulting homobenzylic hydroxylated resin was esterified with 4-bromobenzoic acid (scheme 2).



Scheme 2

Elemental analysis of the esterified resin indicates a content of bromine of 7.2 % corresponding to a loading of 1.1 meq/g. Thus, starting from a Merrifield resin loaded at 1.2 meq/g, the transformation of (chloromethyl)polystyrene into (vinyl)polystyrene is performed almost quantitatively.

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References and Notes.

1. O'Brien RA, Chen T-A, Rieke D. *J. Org. Chem.* **1992**, *57*, 2667-2677. Darling GD, Fréchet JMJ. *J. Org. Chem.* **1986**, *51*, 2270-2276. Fréchet JMJ, Darling GD, Itsuno S. *Pure Appl. Chem.* **1988**, *60*, 353-364. Farrall MJ, Fréchet JMJ. *J. Org. Chem.* **1976**, *41*, 3877-3882. Ruhland T, Künzer H, *Tetrahedron Lett.* **1996**, *37*, 2757-2760

2. Stranix BR, Liu HQ, Darling GD. *J. Org. Chem.* **1997**, *62*, 6183-6186. Stranix BR, Gao JP, Barghi R, Salha J, Darling GD. *J. Org. Chem.* **1997**, *62*, 8987-8993. Stranix BR, Darling GD. *J. Org. Chem.* **1997**, *62*, 9001-9004.

3. Procedure was adapted from ; Alcaraz L, Harnett JJ, Mioskowski C, Martel JP, Le Gall T, Shin D-S, Falck JR. *Tetrahedron Lett.* **1994**, *35*, 5453-5456.
   Typical Procedure : In a flame dried round bottom flask, lithium iodide (12.2 g, 91 mmol, 7.4 eq) and trimethylsulfonium iodide (20.24 g, 99.1 mmol, 8 eq) are suspended in dry THF (350 mL). Butyl lithium (91 mmol, 7.4 eq.) is then added drop-wise at 0 °C. At the end of the addition, the reaction is stirred 40 min at 0 °C. This suspension is then added, at 0 °C, to Merrifield resin (10 g) swelled in dry THF (60 mL) and shaken overnight at room temperature. The reaction mixture is then diluted with methanol (200 mL) and filtered through a 0.5 μ teflon membrane. The resin is washed a first time with a mixture of methanol / acetic acid (80 / 20) and then three times in turn with methanol and methylene chloride. The resin is dried under vacuum at room temperature for one night.