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ORIGINAL ARTICLE

Solid supported reagents for effecting selective transformation in natural products

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KEYWORDS

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Abstract Polymer supported N-bromoacetamide resin can be easily prepared by the bromination of the acetamide resin and can be used for the transformation of furan ring in tetranortriterpenoids to butryolactone with excellent selectivity and in good yield in shorter time under microwave irradiation condition.

1. Introduction

Application of the solid supported reagents in combinatorial synthesis has grown in recent years due to the convenient handling and easy work up procedures. They have been employed in the synthesis of Brunsvicamide A, Lamellarins (Thilo et al., 2008; Poonsakdi et al., 2005), etc. This is very essential in the semisynthetic modification of natural products. The present study demonstrates the use of the solid supported N-bromoacetamide resin for the oxidation of furan ring in tetranortriterpenoids.

2. Materials and Methods

Various tetranortriterpenoids like nimbin, salannin, azadiradione, nimonol, etc. were obtained in the pure form after being subjected to repeated purification by column chromatography from the oil and fruit coat of *Azadirachta indica*. Similarly methylangolensate is obtained from the *Entandrophragm angolense*.

A microwave oven (IFB-Megatron, wattage – 1100 W, power max – 750 W, voltage – 230 Hz, frequency – 2450 MHz) equipped with a refluxing unit was used. NMR spectra were recorded on a Bruker 200 MHz instrument using TMS as the internal reference for both ^{1}H- and ^{13}C-NMR experiments. $CDCl_3$ was used as the solvent. Chemical shifts are given in terms of parts per million (δ scale). IR spectra (cm^{-1}) were recorded on a Perkin–Elmer RX1 FT-IR spectrophotometer. Precoated thin layer chromatography plates (E-merck, Germany, Keiselgel 60 F254, 0.2 mm thickness, coated on aluminum sheets) were used. Column chromatography was performed using silica gel (60–120 mesh and 230–400 mesh).

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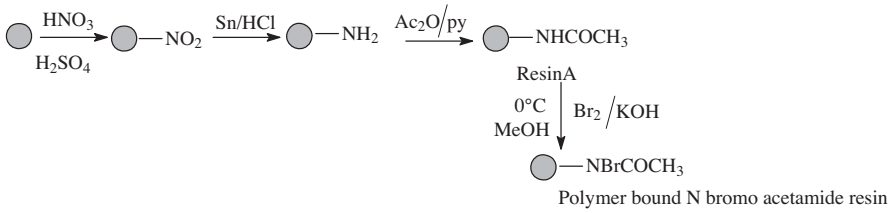
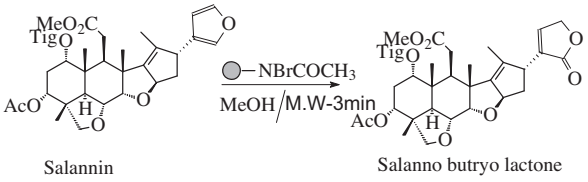
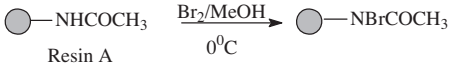


Scheme 1 Preparation of the N-bromoacetamide resin.



Scheme 2 Oxidation of salannin using the N-bromoacetamide resin.



Scheme 3 Regeneration of the resin.

3. Preparation of the resin

3.1. Nitration of the polymer

To 25 g (17.5 ml) of concentrated nitric acid was added 37 g (20 ml) of concentrated sulfuric acid in portions with shaking and the mixture is kept at 0 °C. To this mixture 13 g of the polystyrene beads are added in portions of 2 g with shaking to ensure the complete mixing. The temperature is maintained at 0 °C during the addition. After complete addition the reaction mixture is allowed to stir for 30 min at room temperature. The contents are then poured into ice cold water and the resin obtained is filtered off washed several times with water to remove the acid impurities till the pH of that filtered solution is neutral. The light yellow resin is then washed with acetone and dried. The dried weight of the resin is 14.5 g.

—NO_2

IR (KBr) cm^{-1}: 3455, 1636, 1521, 1422, 1347, 835, 797, 706, 598

1521-NO_2, 835-C–N, 797-CH, C═C

3.2. Reduction of the nitro polymer

To 12.5 g of the nitrated resin 22.5 g of the graduated tin was added. To this mixture 50 ml of the concentrated hydrochloric acid is added down the condenser in portions of 7.5 ml and the contents are shaken well. If the reaction mixture boils vigorously it is made moderate by immersing it in cold water. After the addition of 50 ml of the acid the reaction mixture is heated in a boiling water bath for 45 min. The reaction mixture is then cooled and the contents are poured into the ice cold water. The resin is then filtered off. The filtered resin is taken in a beaker and washed several times with sodium hydroxide to remove the tin particles adhering to the resin. The brown color resin is again filtered off dried and weighed. The weight of the dried resin is 10 g.

—NH_2

IR (KBr) cm^{-1}: 3451, 2924, 2360, 1629, 1518, 1449, 1345, 830, 707

3451-NH, 2924-CH, 830-C–N

3.3. Acetylation of the amine polymer

To a heterogenous solution of 9 g of the resin in 5 ml of dichloromethane 5 ml of the acetic anhydride and 5 ml of pyridine were added and stirred for 24 h. To ensure the completeness of the reaction the reaction mixture is refluxed for 30 min and the resin is then filtered off washed off several times with sodium bicarbonate to remove excess acetic anhydride and then washed with dilute hydrochloric acid to remove the pyridine that is adhering to the resin. The resin is then washed several times with water and dried. The dried weight of the light brown acetamide resin is 9.8 g.

—$NHCOCH_3$

Table 1 Plant and parts from which the tetranortriterpenoids were isolated.

Plant	Part of the plant	Products	Activity
Azadirachta indica	Oil (Govindachari et al., 1995; Henderson et al., 1968; Burke et al., 1969)	Salannin, Nimbin,	Antifeedant
		Desacetyl Salannin, Desacetyl Nimbin	Insect growth regulatory
	Fruit coat	Azadiradione	Anti-inflammatory activity and analgesic activity
Entandrophragm angolense	Bark(Njar et al., 1995)	Methylangolensate	Antifeedant, antimicrobial and anti-ulcer

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