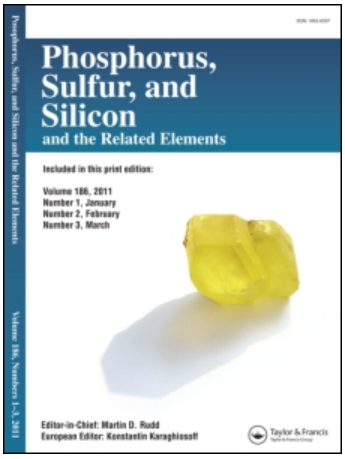



**Phosphorus, Sulfur, and Silicon and the Related Elements**
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

# Reaction of Isothiazolones with Amines

Tirthankar Ghosh

**To cite this Article** Ghosh, Tirthankar(1999) 'Reaction of Isothiazolones with Amines', Phosphorus, Sulfur, and Silicon and the Related Elements, 153: 1, 367 — 368
**To link to this Article: DOI:** 10.1080/10426509908546474
**URL:** http://dx.doi.org/10.1080/10426509908546474

*Phosphorus, Sulfur and Silicon*, 1999, Vol. 153-154, pp. 367-368
Reprints available directly from the publisher
Photocopying permitted by license only



# Reaction of Isothiazolones with Amines

TIRTHANKAR GHOSH

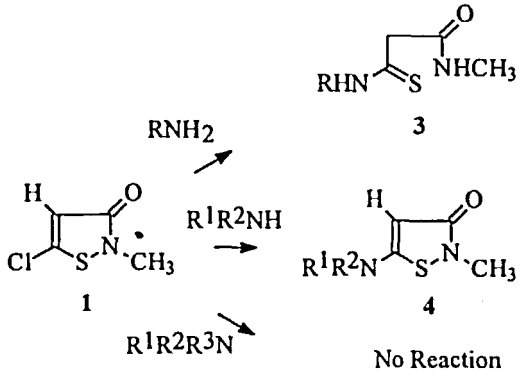
*Rohm and Haas Research Laboratories, 727 Norristown Road, Spring House, PA 19477, USA.*

*Keywords:* isothiazolones; amines; reactions

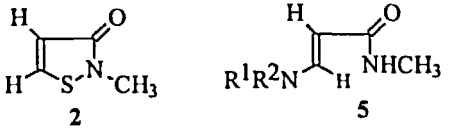


Both 5-chloro-1-methylisothiazolone (1) and 1-methylisothiazolone (2) are widely used and very effective industrial microbicides. They are routinely used in water cooling towers, metal working fluids, cosmetics (shampoo, conditioners, etc.) to prevent the growth of microorganisms. In a number of these applications there are amines present which tend to degrade the isothiazolone molecule. To come up with a strategy to stabilize these molecules we have studied the reaction of molecules **1** and **2** with amines under different reaction conditions.

The reaction of **1** with primary amines results in the formation of the thioamide **3** as the major product. The reaction is slow at ambient temperature but is rapid in refluxing ethanol. The reaction is also accelerated by the addition of thiols. With secondary amines the product is the 5-amino-1-methylisothiazolone (**4**).




The reaction of **2** with primary amines also gives the thioamide **3** as the major product. If the reaction is carried out in the presence of a strained olefin, e.g. nobornylene, the formation of **3** is prevented and norbornane polysulfides are obtained. This indicates the presence of nucleophilic sulfur in the reaction pathway. The reaction of **2** with secondary amines, on the other hand, results in the loss of sulfur and the eneamine **5** is obtained as the major product.




Neither **1** or **2** react with tertiary amines. Although when traces of sulfur are present, rapid degradation of the isothiazolones take place.

Based on the results of this study we have proposed reaction mechanisms for the above transformations. This mechanistic picture suggests that nucleophilic sulfur chains play an important role in these reactions.