

# Synthesis of 1,3,5,7-tetraethynyladamantane

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## Abstract

Four of the first five steps of the synthesis of 1,3,5,7-tetraethynyladamantane were completed and confirmed by IR or NMR with a yield of 21%. As a model system, 1-ethynyladamantane was used for the synthesis of 1,3,5,7-tetraethynyladamantane. Adamantanealdehyde (4) was prepared with a 47% yield.

## Introduction

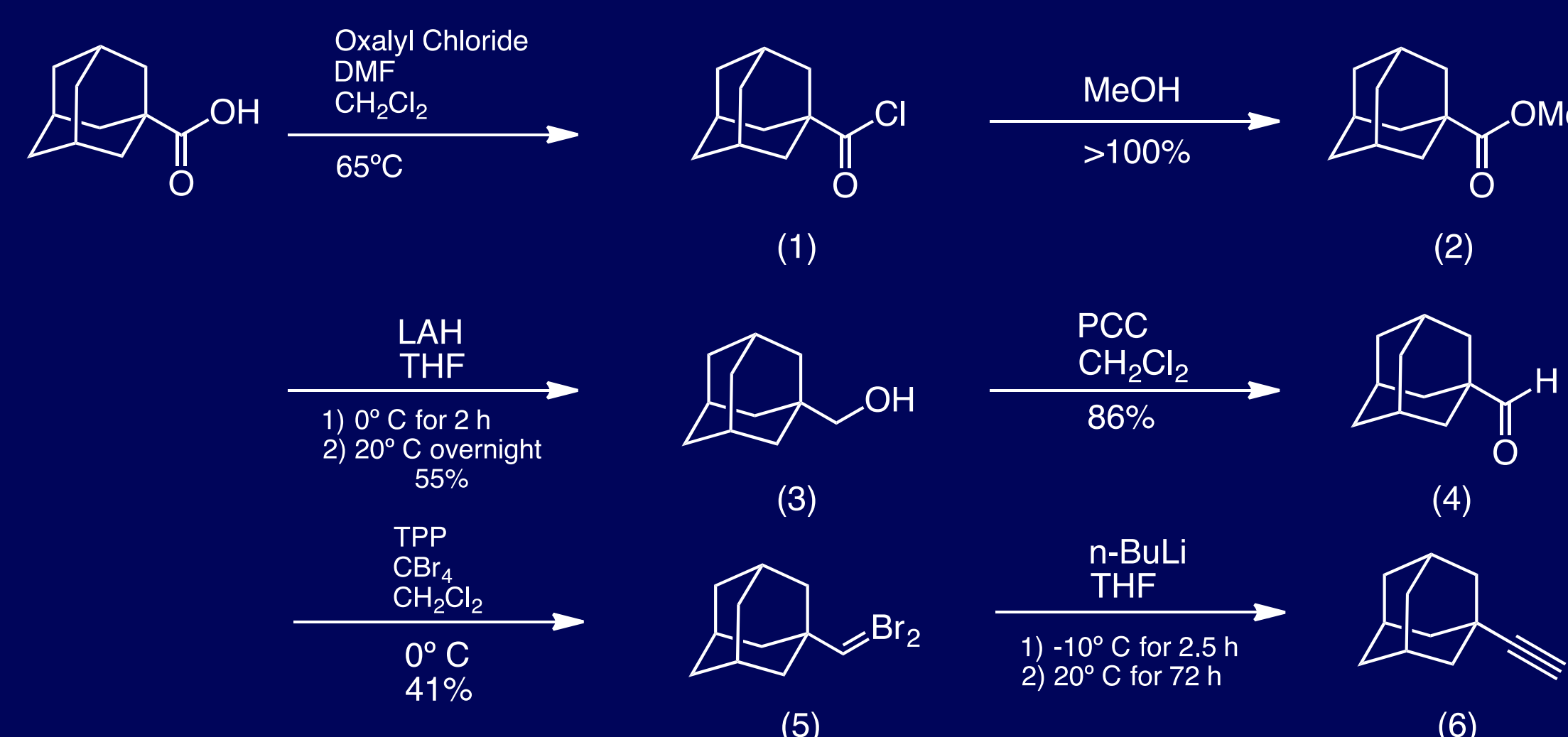
- The overall goal of the project is a more efficient synthesis of 1,3,5,7-tetraethynyladamantane.
- The current published synthesis of this product is 9 steps with an overall yield of 11%.<sup>1</sup>
- Terminal alkynes are useful in organic synthesis because they can undergo a large number of reactions, such as nucleophilic or electrophilic addition, hydroboration-oxidation, hydration, reduction, or organometallic coupling reactions.<sup>2</sup>
- This versatility would allow the molecule to be functionalized in a large number of ways.
- The structure of 1,3,5,7-tetraethynyladamantane potentially has interesting characteristics, such as being able to form 3D polymers and its potential to conduct electricity.
- As a model for the tetra-substituted product, the synthesis of 1-ethynyladamantane was chosen.

## References

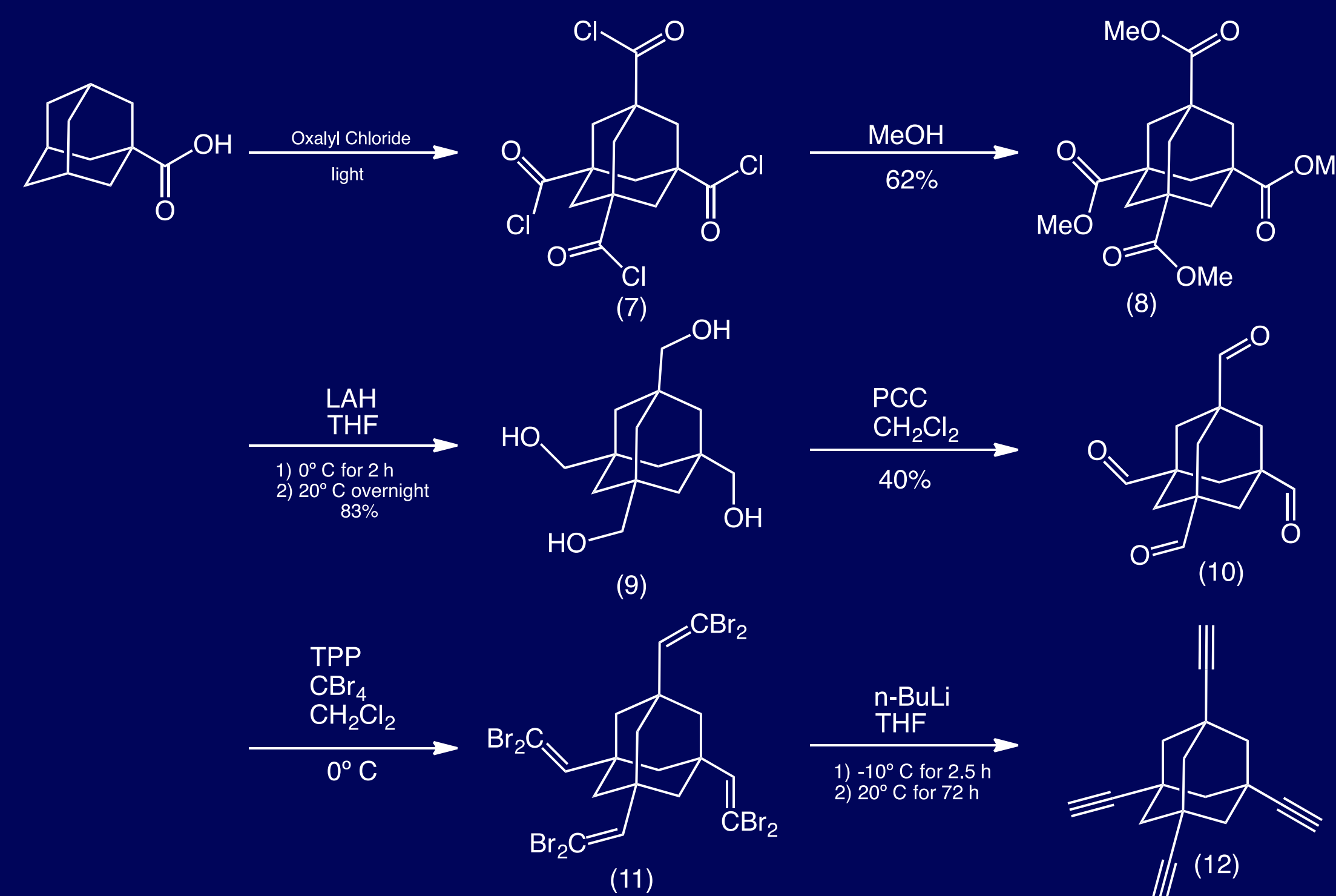
- Naemura, K.; Hokura, Y.; Nakazaki, M., Synthesis of (+)-1,3,5,7-tetrakis[2-(1S,3S,5R,6S,8R,10R)-D3-trishomocubanylbuto-1,3-diynyl]adamantane. *Tetrahedron* **1985**, (42), 1763-1768.
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## Methods

### Synthetic Pathway for 1-ethynyladamantane



### Synthetic Pathway for 1,3,5,7-tetraethynyladamantane



## Results/Discussion

- 1-ethynyladamantane was synthesized and characterized through the first four steps of the reaction and it was determined that the yield to that point was 47%.
- 1,3,5,7-tetraethynyladamantane was synthesized and characterized through the first four steps as well, and it was determined that the yield to this point was 21%.

## Conclusions

- While neither product was fully synthesized, four of the five steps in the proposed reactions were completed and characterized by either NMR or IR spectroscopy.
- The proposed synthetic pathway is viable as a more efficient synthesis of these compounds.

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