

Short Note

# Luminescent Lariat Aza-Crown Ether Carboxylic Acid

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**Abstract:** Lariat ethers are interesting recognition motifs in supramolecular chemistry. The synthesis of a luminescent lariat aza-crown ether with a carboxyl group appended by azide-alkyne (Huisgen) cycloaddition is presented.

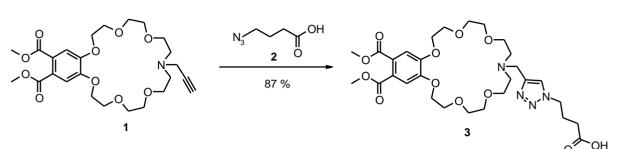
Keywords: crown ether; cycloaddition; triazole; ammonium receptor; lariat ether; podand

## 1. Introduction

Luminescent crown ether amino acids which bind ammonium ions and signal the binding event by changes of their specific emission properties were published recently [1]. These are versatile building blocks for amino acid and peptide receptors [2–4]. Introduction of charged groups [5–8] may enhance the cation binding affinity of crown ethers [9]. The copper(I) catalyzed dipolar cycloaddition (Huisgen cycloaddition) is known to be a robust ligation method for a variety of differently substituted azides and alkynes [10–12]. We present the functionalisation of luminescent aza-crown ethers with anionic podand arm by this method. Such a compound is expected to have enhanced ammonium ion binding properties.

#### 2. Synthesis

The lariat ether was prepared by dipolar azide-alkyne (Huisgen) cycloaddition at the side chain of the propargyl-substituted crown ether (1) with 4-azidobutyric acid (2).



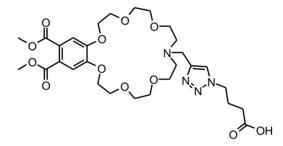
Scheme 1. Synthesis of the new lariat ether 3 by copper(I) mediated dipolar cycloaddition.

Conditions: MeOH, H<sub>2</sub>O, CuSO<sub>4</sub> \* 5 H<sub>2</sub>O, Na-ascorbate, N<sub>2</sub>, RT to reflux, 5h, 87%

### 3. Experimental

Crown ether 1 [2] and 4-azidobutyric acid (2) [13] were prepared as published.

*14-[4-(4-Methyl-1H-1,2,3-triazol-1-yl)butanoic* acid]-6,7,9,10,13,14,15,16,18,19,21,22-dodecahydro-*12H-5,8,11,17,20,23-hexaoxa-14-aza-benzocycloheneicosene-2,3-dicarboxylic* acid dimethyl ester (**3**)



Compound **1** (102 mg, 0.2 mmol) was dissolved together with compound **2** (39 mg, 0.3 mmol) in 1.0 mL of methanol. A solution of copper(II)sulphate pentahydrate (10 mg, 0.02 mmol) in 0.5 mL of water containing sodium ascorbate (16 mg, 0.1 mmol) was added slowly. Under nitrogen atmosphere, the mixture was vigorously stirred for 1 h at room temperature, then for 5 h at 60 °C. It was cooled to room temperature, dichloromethane (9 mL) was added, the aqueous layer was separated and the organic phase was washed with brine (3 mL). After drying over MgSO<sub>4</sub>, a dry load with a minimum amount of silica gel was prepared. This was transferred to a short column containing a thin layer of silica gel. Ethyl acetate/ethanol 3:1 was used to wash all impurities off the column ( $R_f$  (**3**) = 0.0). The solvent mixture was changed to chloroform/methanol 4:1 to elute compound **3** ( $R_f$  (**3**) = 0.1). The lariat ether (**3**) appears as colourless glass (110 mg, 0.174 mmol, 87%).

**MF:** C<sub>29</sub>H<sub>42</sub>N<sub>4</sub>O<sub>12</sub>–**FW:** 638.68 g/mol; -**IR** (neat): ν (cm<sup>-1</sup>) = 3040 (w), 2949 (m), 2812 (m), 1719 (s), 1598 (m), 1519 (m), 1435 (m), 1349 (m), 1289 (s), 1247 (m), 1199 (m), 1123 (s), 1049 (m), 977 (m), 945 (m), 746 (s), 664 (m); -**MS** (ESI-MS, CH<sub>2</sub>Cl<sub>2</sub>/MeOH + 10 mmol NH<sub>4</sub>OAc): m/z (%) = 639.2 (100, MH<sup>+</sup>); -**UV** (MeOH):  $\lambda$  (ε) = 269 (8600), 225 (30500); -**HRMS** (PI-LSIMS FAB Glycerine): calc. for C<sub>29</sub>H<sub>43</sub>N<sub>4</sub>O<sub>12</sub><sup>+</sup>: 639.2877, found: 639.2865; -<sup>1</sup>**H-NMR** (300 MHz, CDCl<sub>3</sub>): δ [ppm] = 2.02–2.26 (m, 4 H), 2.85 (m, 2 H), 3.55–3.68 (m, 12 H), 3.69–3.80 (m, 4 H), 3.86 (s, 6 H), 3.83–3.96 (m, 4 H), 4.20 (m, 4 H), 4.35 (t, 2 H, *J* = 6.3 Hz), 7.18 (s, 2 H), 7.70 (s, 1 H); -<sup>13</sup>**C-NMR** (75 MHz, CDCl<sub>3</sub>): δ [ppm] = 26.1 (-, 1 C), 49.5 (-, 1 C), 49.7 (-, 1 C), 52.6 (+, 2 C), 53.3 (-, 2 C), 53.4 (-, 1 C), 68.4 (-, 2 C),

69.1 (-, 2 C), 69.4 (-, 2 C), 70.3 (-, 2 C), 70.6 (-, 2 C), 114.0 (+, 2 C), 124.1 (+, 1 C), 125.6 (C<sub>quat</sub>, 2 C), 143.3 (C<sub>quat</sub>, 1 C), 150.5 (C<sub>quat</sub>, 2 C), 167.7 (C<sub>quat</sub>, 2 C), further signals were not detectable.

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