Scientific report

[2.2]Paracyclophane linkers for Metal-Organic Frameworks,

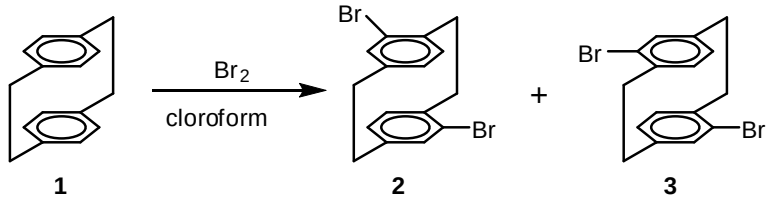
stage 1 – 2020

Stage 1 summary – [2.2]Paracyclophane bromination

During the first stage of the project, the necessary brominated derivatives were synthesized. *Pseudo-meta* and *pseudo-para* dibromo[2.2]paracyclophanes were obtained by means of bromination using molecular bromine. *Pseudo-orto* dibromo[2.2]paracyclophane was obtained from the *pseudo-para* isomer through thermolysis. The *pseudo-gem* isomer was synthesized from 4-nitro[2.2]paracyclophane using a bromination-reduction-diasotisation sequence. 4,7,12,15-Tetrabromo[2.2]paracyclophane was obtainedthrough the bromination of the parent molecule using molecular bromine in the absence of light. 4,7,11,14-Tetrabromo[2.2]paracyclophane was obtained from *pp*-dinitro[2.2]paracyclophne through a bromination-reduction-diasotisation sequence.

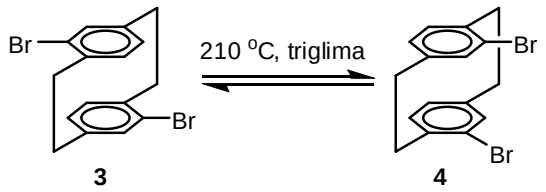
Stage 1 methodology

The bromination of the parent molecule **1** in chloroform yielded the *pseudo-meta and pseudo-para* isomers **2** and **3**. Their separation was achieved by taking advantage of their different solubilities in dichloromethane/ethanol. The NMR data recorded for the two isomer is similar to that reported in the literature.



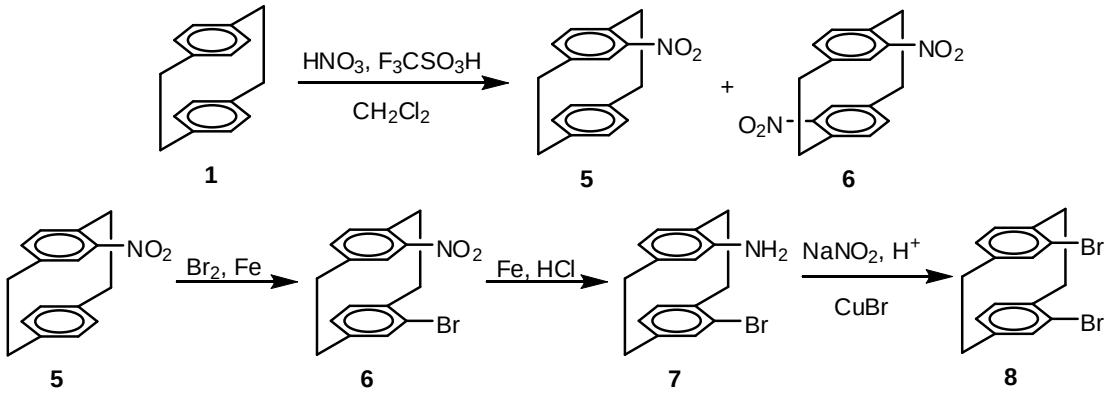
Scheme 1 – P*seudo-meta* and *pseudo-para* dibromo[2.2]paracyclophane synthesis.

The *pseudo-ortho* isomer **4** was obtained by heating **3** to 210 °C in triglyme, followed by precipitation of the unreacted material using ethanol (Scheme 2).



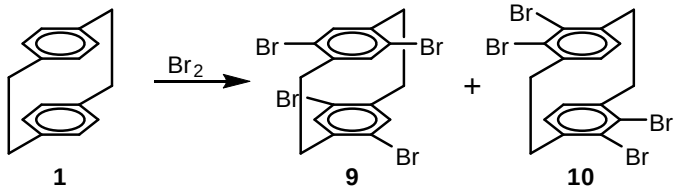
Scheme 2 – Thermal conversion of **3** to the *pseudo-orto* isomer **4**.

Nitration of the parent molecule led to 4-nitro[2.2]paracyclophane, which was then brominated using bromine and iron fillings. The resulting intermediary was then reduced and the newly formed amino group was converted to a bromo substituent by means of a diasotisation reaction (Scheme 3).



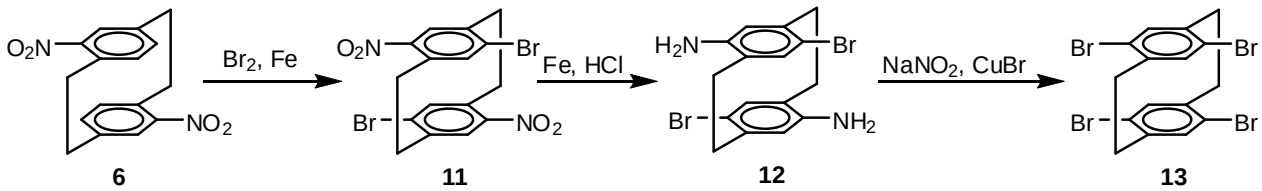
Scheme 3 – The synthesis of *pseudo-gem* dibromo[2.2]paracyclophane **8**.

4,7,12,15-Tetrabromo[2.2]paracyclophane **9** was obtained along 4,5,12,13-tetrabromo[2.2]paracyclophane **10** using molecular bromine, in the absence of light. The two isomers were separated based on their different solubilities in dichloromethane/ethanol.



Scheme 4 – The synthesis of 4,7,12,15-tetrabromo[2.2]paracyclophane **9**.

Pseudo-para dinitro[2.2]paracyclophane **6**, synthesized by means of [2.2]paracyclophane nitration, was brominated using bromine and iron fillings. The nitro groups were then reduced and converted to bromo sustituents using diasotisation reactions, yielding 4,7,11,14-tetrabromo[2.2]paracyclophane **13** (Scheme 5).



6 **11** **12** **13**

Scheme 5 – 4,7,11,14-Tetrabromo[2.2]paracyclophane **13** synthesis.

Dissemination

A part of the results obtained during this stage were published in the journal *Molecules*, **2020**, *25*, 5262.

Project director,

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