Regioselective Synthesis of *N*-Aryl-Fulleropyrrolidine Multiadducts for Use in Molecular Electronics

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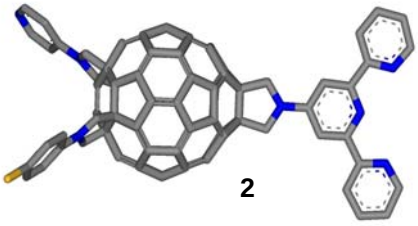
The very rich electrochemistry of fullerenes has generated interest for their use in molecular electronics applications. C_{60}, the most abundant fullerene, has 8 redox states (6- to 1+). Several of these states are relatively stable, yet to date and to the best of our knowledge they have not been exploited much to prepare conducting organic molecules for use in molecular electronics, especially as transistors. Previous work by our group showed that attaching an *N*-pyridylpyrrolidine moiety to the fullerene led to an electronically coupled lone pair on the pyridine with the fullerene core. We have prepared *trans*-1 bisadducts containing pyridylpyrrolidine (**1**) and terpyridylpyrrolidine groups and are currently studying their electronic properties. These were regioselectively synthesized using the concept of orthogonal transposition, which involves a protection/deprotection scheme in order to prepare our starting material, a tetra-equatorial malonate C_{60} molecule. From there we propose to prepare new *trans*-1 bisadducts containing *p*-aminophenyl and *p*-thiophenyl groups. These different functional groups will allow for selective connectivity to gold (the thiophenol) or platinum (the pyridyls) or to complexation with transition metals (the terpyridyl groups) and should lead to pronounced changes of the electronic properties. Additionally, we propose to regioselectively prepare trisadducts (such as **2**), which can be viewed as redox centers connected by three-leads. These leads can be the same or all different. The example shown, **2**, contains three different groups for differential connectivity via self-assembly. These will also be prepared from the tetramalonate compound, and the groups varied to allow for multiple combinations of functionality. The final steps in these syntheses involve reductive retro-cyclopropanation, introduced and studied extensively by our research group. Once prepared, we will study their self-assembly onto metal surfaces and probe the electronic and conductive properties via electrochemistry. The participating REU students will initially be involved in synthetic preparations, mainly the regioselective synthesis of bisadducts (similar to **1**) and trisadducts (similar to **2**). Once prepared, the REU students will be trained to conduct electrochemistry to investigate the electronic properties of these compounds and of their self-assembled monolayers on gold surfaces.



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