Chemical and Electrochemical retro-cyclopropanation reactions of C60-derivatives

Mª Angeles Herranz,1 Luis Echegoyen,1 Marcel Beulen,1 José Rivera,1 Nazario Martín,1 Beatriz Illescas2 and Marta C. Díaz2

1 University of Miami, Department of Chemistry, 1301 Memorial Drive, Coral Gables, FL 33124, U.S.A.
2 Universidad Complutense de Madrid, Departamento de Química Orgánica I, Madrid E-28040, Spain

The electrochemical retro-Bingel reaction was recently reported by Diederich and Echegoyen [1]. The reaction, an electrolytic reduction, removes d[alkoxycarbonyl]-methano adducts to yield the parent fullerene. The potential for using these addends as protecting groups in fullerene chemistry prompted the use of chemical reaction conditions to effect these transformations [2]. However, the results obtained using (Mg/HgBr2/THF/80°C) were not reproducible in some cases.

We have recently reported how the range of fullerene adducts that can be removed via electrolytic reduction also includes spyrromethano-type adducts [3]. In order to investigate the mechanisms and possible applications of these new electrochemical reactions, we have synthesized compounds 1-3 in Figure 1. These compounds have as a common characteristic the nitrophenyl group, which when reduced exhibits a strong and easily recognizable EPR signal.

We have also attempted chemical retro-Bingel reactions with these spyrromethanofullerrenes following the synthetic procedures previously described [3]. We have also changed the protocol and introduced 18C6 and the yields are considerably improved and more reproducible. Even in the absence of the highly toxic HgBr2 the reaction works very well. These results will be presented and discussed in detail.


Figure 1. New nitro-compound derivatives 1-3 studied in retro-Bingel processes.