New adventures in exohedral derivatization of fullerenes and metallofullerenes

N.B. Shustova*, I.V. Kuvychko*, A.A. Popov[+], S.H. Strauss*, O.V. Boltalina*, S. Stevenson[‡], J.P. Phillips[‡], M.A. Mackey[‡], and C.E. Coumbe[‡]

**Colorado State University, 80523 Fort Collins, USA*
[+]Moscow State University, Moscow, 119899, Russia
[‡]University of Southern Mississippi, Hattiesburg, Mississippi 39406

After over a decade of a very intense exploratory phase, fullerene chemistry has now establlished itself as a more mature field, which sets new goals and higher quality requirements for synthetic chemists. New knowledge and experiences accumulated in recent years by scientists call for some of the earlier synthetic reports to be re-examined, and corrected when necessary. A recent example of such work on the synthesis of chlorofullerene, $C_{60}Cl_6$, was reported by our group [1].

At the same time, novel areas of fullerene synthetic chemistry continue to emerge nowadays. This is explained by the unique chemical nature of fullerenes which combine high chemical reactivity and unprecedented diversity of the isomeric structures of derivatives. The family of fullerene substrates continues to grow rapidly due to discoveries of new derivatives or even new cage structures [2].

In this report, we shall describe some of the latest developments in the exohedral derivatization of fullerenes from our labs. These include both new synthetic directions and techniques, and re-examinations of the chemical reactions reported previously by us or others. Besides C_{60} and various higher fullerenes, our studies also include a new promising class of clusterfullerenes - trimetallic nitride clusterfullerenes [3]. Decoration of metallofullerene spheres with various functional groups brings about a dramatic change in properties, which may be beneficial in potential applications.

[1] I.V. Kuvychko; et al., *Chem. Eur. J.* **11**, 5426 (2005).
[2] N.B. Shustova et al., *J. Am. Chem. Soc.* **128**, 15793 (2006).
[3] S. Stevenson et al., *Nature* **401**, 55−57 (1999).