$C_{60}H_{36}$ - synthesis under high pressure and mass-spectrometric study

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Promising practical applications of the systems based on the fullerene hydrides have attracted great interest and also enabled rapid development of the relevant research. The prospect of the creation of the reversible hydrogen accumulators was postulated.

We found that properties of hydrofullerenes, such as stability in air, structure and composition, depend on the preparation methods. Hydrofullerenes (deuterofullerenes) prepared by direct hydrogenation methods and solid phase reactions reveal the highest stability among the studied compounds.

In the present study, the results of hydrogenation of C_{60} by AlH_3 under pressure ~30 kbar in the temperature range (350-700^{0}C) are reported. Obtained compounds were the powders of different colors, depending on the synthesis temperature.

Mass-spectra were obtained using Kompact MALDI IV and Vision-2000. As a matrix we used 1,2 dihydrobenzoic acid or α-cyano-4-hydroxycinnamic acid, which showed the lowest fragmentation level.

For the samples prepared at lower temperatures (350-500 ^{0}C) the peak of $C_{60}H_{35}^+$ has the highest intensity. Loss of one H atom from $C_{60}H_{36}$ is a result of the fragmentation/degradation under laser irradiation conditions. So we concluded that the main product of the hydrogenation in this temperature range is $C_{60}H_{36}$. Upon increasing the reaction temperature (500-700 ^{0}C) degradation of the carbon cage takes place, which is confirmed mass spectrometrically, but even in these high temperature hydrogeanated products $C_{60}H_{36}$ was still the most abundant, showing the remarkable stability of this hydrofullerene.