

THE NEW METHOD OF FULLERENES AND CARBON CLUSTERS GETTING FROM THE INDUSTRIAL SMOKE GASES BY USING AN ELECTRICAL DISCHARGE

Borisenko A.V. *

«Absolute Kazakstan» Company, B.Zhirau av. 55, Karaganda, 100008, Kazakstan

* FAX: +7 (3212) 41-25-62, 41-10-75. E-MAIL: 411075@MAIL.KZ

We have worked out and tested technology of the plasma treatment of the industrial smoke gases, which allows to fulfill the gas phase processes of the restoration of carbon oxide (II, IV) with getting of nanosized parts of carbon (fullerenes, soot) with high efficacy (fig. 1) [1-4]. Peculiarity of this technology is that the gas, which is exposed to treatment, is given to the area between cathode, which is the source of unipolar ionization, and anode - as a stream of water, which are made as coax axial cone surface. Cathode is surface, which has very many needles with the radius of curvature of point about several microns (fig. 1). Near the point of the needle special conditions of "ionic pump" (high tension of electrical area - from $5 \cdot 10^2$ till 10^7 V/cm, high negative unipolar ionization - about 10^{17} m³) are fulfilled, which lead to the intensive mass exchange of gas through the "near point" area. In the zone of electrical discharge CO₂ and CO disintegrate to the elementary carbon and the main end product is hard carbon C_n (C₆₀, C₇₀ (to 10%) and in big quantity amorphous carbon as a soot.

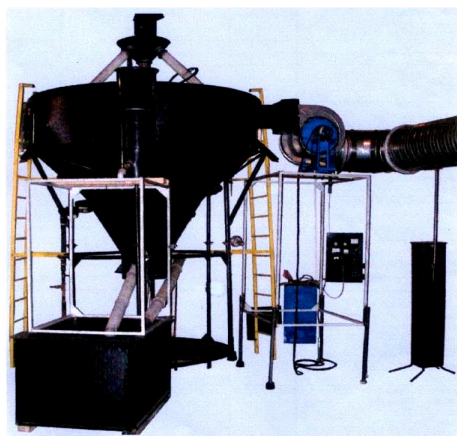


Fig. 1. Process gas cleaning B-5 module

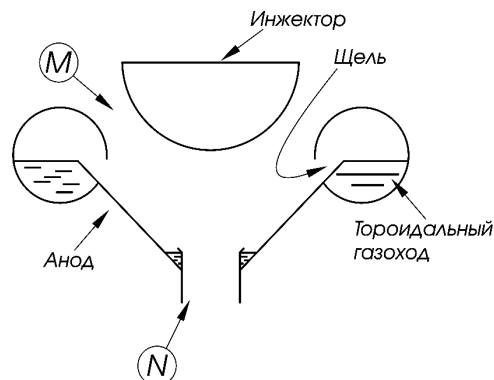


Fig. 2. Gas cleaning B-5 plant circuit

The possible mechanisms of the formation of carbon clusters are examined. Potentials of ionization, relation to the electron for series of carbon clusters of different structure (C₂, C₄, C₁₀, C₆₀ etc.) are calculated. Great influence of concentration of electrons, of charge of clusters and parameters of plasma is showed theoretically on the speed of formation of fullerenes in carbon containing plasma.

References

1. Предпатент № 14236 (Казакстан). Устройство для очистки газов / Борисенко А.В., Гришин А.В. Оpubл. 15.04.04 // Бюлл. изобр., №4.
2. Пред. патент № 14237 (Казакстан). Способ очистки газов. / Борисенко А.В., Гришин А.В. Оpubл. 15.04.04 // Бюлл. изобр., №4.
3. Борисенко А.В. // Материалы II-ой межд. научно-практической конференции «Теоретическая и экспериментальная химия». Караганда, 2004. С.203-204.
4. Борисенко А.В. // Материалы межд. научно-практической конференции «Состояние и перспективные направления развития углеродной химии». Караганда, 2004. С.18-22.