

Tritium label in studying composites of humic substances with nanodiamonds

Abmetko I.V.¹, Chernysheva M.G.¹, Kulikova N.A.^{1,2}, Badun G.A.¹, Perminova I.V.¹

¹Lomonosov Moscow State University, Moscow, Russia, ira_abmetko@mail.ru

²Bach Institute of Biochemistry of RAS, Moscow, Russia

doi: 10.36291/HIT.2019.abmetko.056

Tritium labeled compounds can be used as a tracers of compound concentration in different systems including biological objects [1]. The method is characterized with high sensitivity and the detection level is determined by the specific radioactivity of the labeled compound.

In present study the approach was applied for characterization of adsorption composites of detonation nanodiamonds and humic substances (HS). We used nanodiamonds (Aldrich) as received and subjected to air annealing that results in the reversion of zeta potential of nanoparticles in the aqueous suspension from positive to negative value. Coal humic acids and peat fulvic acids were used. Tritium label was introduced in the HS using tritium thermal activation method according to the procedure [2].

Composites were purified from non-bound HS and final composites were characterized by dynamic light scattering to determine particles size and zeta potential in the aqueous suspensions and liquid scintillation spectrometry to direct determination of HS surface concentration. To analyze the composites uptake and biodistribution in plants adsorption complexes of non-radioactive HS and tritium labeled nanodiamonds were obtained [1, 3].

In the presentation we are going to discuss the peculiarities of HS adsorption on nanodiamonds, the influence of HS type and surface properties of nanodiamonds. It was found that equilibrium adsorption of fulvic acids on positively charged nanodiamonds riches 80 mg/g and decreases to 30 mg/g after washing the composite from poorly bound HS. In the case of nanodiamonds subjected to air annealing adsorption was as much as 3 times lower.

Moreover, both initial and annealed nanodiamonds, as well as its adsorption composites were tested in the matter of how it can be uptake by wheat seedlings. In this experiments tritium labeled nanodiamonds [3] were used in both in the control experiments with plants and preparation of adsorption composites with HS following by interaction with wheat seedlings. It was shown that adsorption on roots was less for nanodiamonds subjected to air annealing, while penetration into above-ground parts was similar for both types of nanodiamonds. The detail results will be shown in the presentation.

Acknowledgements. This work was supported by Russian Foundation for Basic Research (grants # 17-03-00985, 18-33-20147).

References

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