POWERFUL WATER-SOLUBLE OXIDIZING HYPERVALENT IODINE REAGENTS: STRUCTURE AND REACTIVITY

I.A. Mironova
Scientific adviser – Dr. of Science, Professor M.S. Yusubov

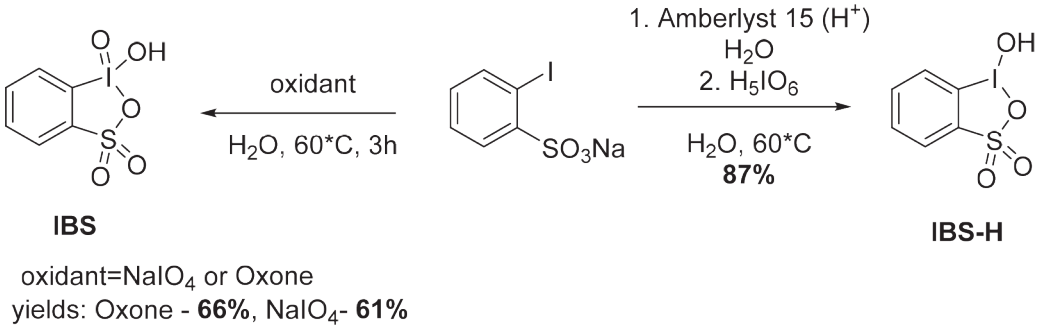
National Research Tomsk Polytechnic University
634050, Russia, Tomsk, 30 Lenin Avenue, iam6@tpu.ru

Currently, the chemistry of polyvalent iodine is a rapidly growing field of modern organic chemistry [1]. Over the past 20 years, over 11 thousand articles and about 500 reviews on the chemistry of hypervalent iodine have been published. Hypervalent iodine compounds are increasingly used in organocatalysis and various oxidative transformations instead of expensive and environmentally unfriendly transition metal compounds, that is why the first ones correspond to the principles of "green chemistry" [2]. Therefore, the search for effective reagents, as well as new reactions with their utilization, is extremely promising and important for both fundamental and applied science.

Our attention was directed to water-soluble polyvalent iodine reagents, in particular, 2-iodoxybenzenesulfonic acid (IBS). This reagent was first synthesized in 2006 by direct oxidation of 2-iodobenzenesulfonic acid or hydrolysis of ester of 2-iodolbenzenesulfonic acid; however, it was not possible to isolate the product individually without inorganic impurities, as IBS has excellent solubility in water and high reactivity toward organic solvents [3–4].

We investigated the oxidation of 2-iodobenzenesulfonic acid and its sodium salt using Oxone, sodium periodate and periodic acid (Scheme 1).

We have shown that iodine (V) compound is



Scheme 1. *Synthesis of 2-iodoxybenzenesulfonic acid (IBS) and 2-iodosylbenzenesulfonic acid (IBS-H)*

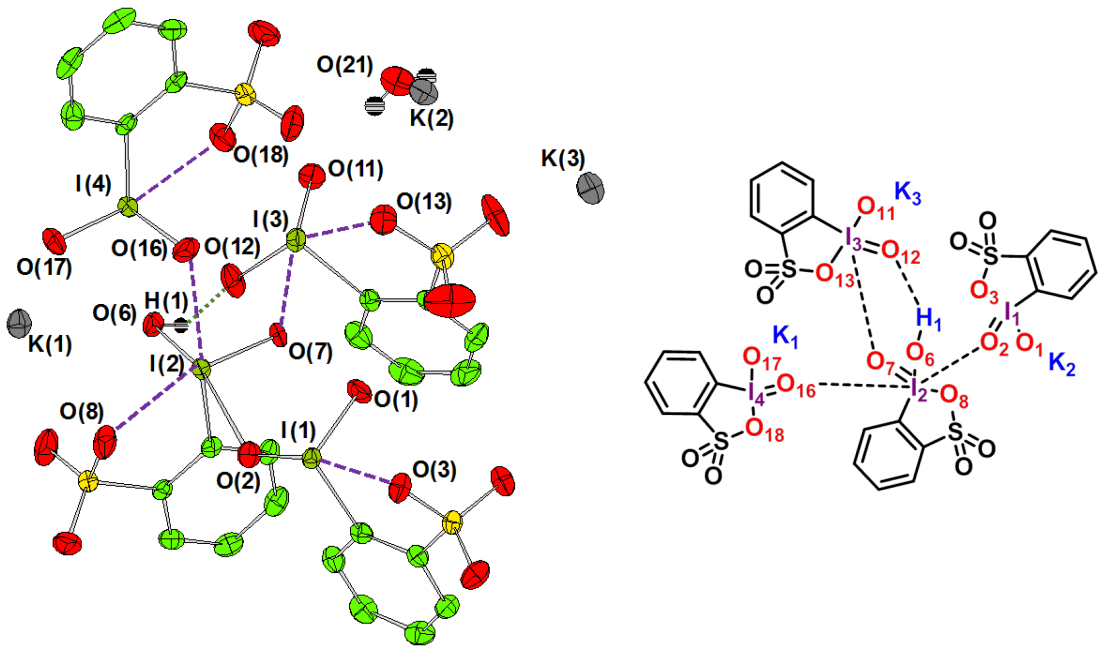


Fig. 1. *X-ray structure and its representation in ChemDraw*

formed under neutral conditions, while iodine (III) one, 2-iodosylbenzenesulfonic acid (IBS-H), which was previously described in [3], is formed in acidic media.

For the first time, we were able to isolate the target product - 2-iodoxybenzenesulfonic acid - in an individual form, which allowed us to carry out XRD (Figure 1) [5].

Further work involves the study of the reactivity of IBS and IBS-H in various oxidative transformations. Moreover, these compounds can be used as starting compounds for the synthesis of interesting reagents that can easily functionalize organic molecules.

References

1. *Yoshimura A. et al. // Chem. Eur. J., 2018.– 24.– 1.*
2. *Sun C.-L. et al. // Chem. Rev., 2014.– 114.– 18.– 9219.*
3. *Koposov A.Y. et al. // Eur. JOC., 2006.– 4791.*
4. *Uyanik M. et al. // JACS, 2009.– 131.– 25.*
5. *Mironova I.A. et al. // Beilstein JOC, 2018.– 14.– 1854.*

RESEARCH OF PHYSICAL CHEMICAL AND SORPTION PROPERTIES OF NANOSTRUCTURED SORBENT ON SYNTHETIC BASE

O.I. Mishukova, D.V. Martemianov, E.A. Denisenko

Scientific adviser – Ph.D., Senior Lecturer of Division for Nuclear-Fuel Cycle S.P. Zhuravkov

National Research Tomsk Polytechnic University

634050, Russia, Tomsk, 30 Lenin Avenue, oksana_mishukova@mail.ru

More and more the problem of surface water pollution is coming a burning issue at present [1]. Before using the water for drinking and technological purposes, the one must have a preliminary purification from chemical and microbiological admixtures [2]. Ones from the most dangerous chemical admixtures into water are arsenic ions which can be represented l by trivalent and pentavalent states [3]. When arsenic contaminated water is consumed, it is bioaccumulated in living tissues, which adversely affects human life and health. Among the various means of water purification, a sorption method is very widely adopted [4].

In this work it was researched a sorption material on base of aerated concrete and hematite mineral had been modificating by iron oxyhydroxide [5]. The particles size of aerated concrete and hematite mineral was 1.5–2.5 mm. The active component was iron oxyhydroxide which immobilases on the bearer using sol-gel process. It was carried measurements of specific surface and specific volume of pores for the studying sorbent and its components using the thermal nitrogen desorption method on "Sorptometr M" device. The sorption experiments of the samples were carried in static conditions under agitation by magnetic mixer. During studied process, As (III) ions were extracted from the model solution. The model solution was prepared on base of distilled water and State Standard Sample containing as starting concentrations 5.17 mg/dm^3, 20.4 mg/dm^3, 40.21 mg/dm^3 of arsenic ions. The sample and the model solution had been in the ratio 1 g : 100 cm^3 respectively and they were agitation by magnetic mixer

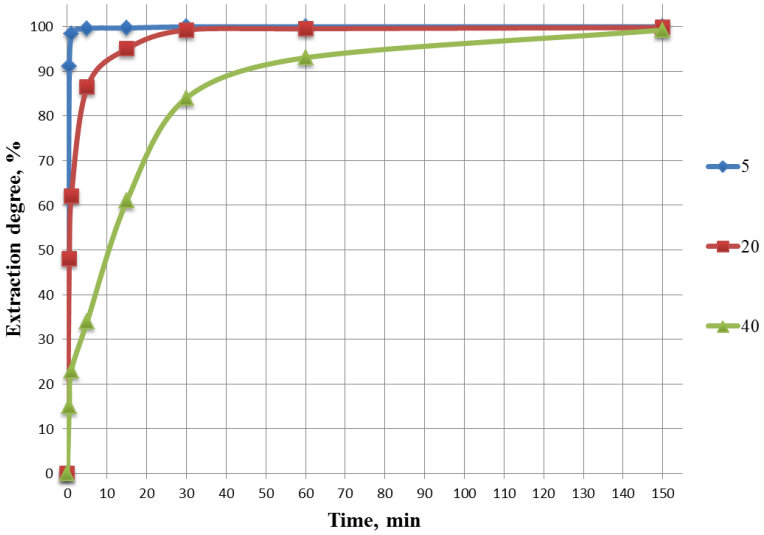


Fig. 1. *Determination of extraction degree of As (III) ions from water solution using the studied sorbent under different concentrations of the model solution*