Progress in Chemical and Biochemical Research

Journal homepage: www.pcbiochemres.com

Short Communication

The Role of Distillation of Solid O-Bromoaniline with its Coloring Phenomenon

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ARTICLE INFO

Article history

Submitted: 2020-05-14
Revised: 2020-06-30
Accepted: 2020-07-04
Available online: 2020-07-11
Manuscript ID: PCBR-2005-1095
DOI: 10.33945/SAMI/PCBR.2020.3.9

KEYWORDS

O-bromoaniline
solid distillation
fractional distillation distillation under vacuum

ABSTRACT

This short paper deals with the coloring phenomenon that occurs in O-bromoaniline from white to very dark. It is found that the very pure compound exhibits a significant resistance towards this phenomenon as stays for a long period without discoloring. Such a result is clearly of great interest to anyone whom produces, marketing, or purchases and uses O-bromoaniline on a regular basis. The results show that the conventional methods for purification of solid compound such as recrystallization are not sufficient. It has been found that the fractional distillation under vacuum for this solid material gives a pure compound possesses a resistance against discoloring phenomenon. In other words, the conventional methods of purification cannot made absolute remove of impurities as the latter are responsible for the colouring phenomenon of the presented compound. In particular, the listed purification procedure should allow chemical companies to produce and market a better quality product of O-bromoaniline.

GRAPHICAL ABSTRACT

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Introduction

In general, organics compounds are comparatively having less stability in contrast to other related materials. The reason for this may be attributed to the nature of the bonds between the atoms of these molecules, as the covalent bond is weaker than ionic bond. In other words, the attractive force that belonging to covalent bond is magnetic due to the opposite spin of valance electrons in contrast to that of electrostatic for other related forces. However, the oxidation can be considered as the most common chemical process that responsible for breaking down the organic molecules in solid state.

Aromatic amines can be considered as important chemical agents that employed in many chemical industries. In particular, amines are used as antioxidants and intermediates in preparation many essential compounds such as drugs, plastics and pesticides [1, 2]. However, it has been found experimentally that the O-bromoaniline as it chemical structure presented in Figure 1 was received commercially in dark color, which not reflect the real color of this compounds. According to the practical experiments, it was found that the white or real color of this substance only obtained when freshly purified by recrystallization method, which then turns to dark color. Hence, the presented work introduces a method that overcome this problem by letting this solid material remains white by using fractional distillation under vacuum with relatively hot condenser.

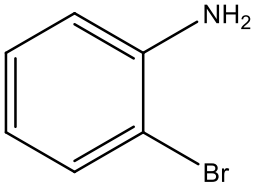

Fig 1. Chemical structure of O-bromoaniline

Experimental

Purification Method

The dark colored compound that supplied by Fluka or Aldrich was fractionally distilled under vacuum (60-61^{o}C/1.33-1.46kPa). In order to prevent the freezing of such a compound (MP=32.0°C), the condenser should be kept warm during distillation. However, a colorless liquid was obtained to give a pure white solid of O-bromoaniline [3].

Results and discussion

It is well known that the aromatic amines are very easily oxidized by atmospheric oxygen, most of the compounds are colorless when pure which they are often encountered discolored by oxidation products [4]. However, the coloring phenomenon that occurs in O-bromoaniline (from white to very dark or black color) deserves attention particularly by analytical chemists [5, 6]. In actual, this compound is commercially delivered as a dark-colored solid in a sealed container, which bears a label that reads, "Keep under argon" (e.g. Fluka AG, Chemische) [7]. On the other hand, as this compound is in solid state, the purification of this compound using the conventional methods (recrystallization) [8, 9] gives a white solid, but it turns to a deep dark color within a few hours. A considerable efforts have been made using recrystallization procedure in different ways in order to avoid the coloring phenomenon of O-bromoaniline were not successful. Hence, the classical purifications methods for materials in solid state have no benefit for the presented compound [3]. On the other side, the fractional distillation is a powerful for purification the matter in condensed phase. The distillation method was employed for O-bromoaniline, which must be under vacuum to prevent the thermal decomposition of this material. At the same time, no cooling water must be circulating through condenser in order to

remain the compound in liquid state. The method that used in the present work was yielded a pure compound, which remained white solid for more than one year.

The presented method gives colorless needle crystals and a colorless pure liquid when it is melted. This suggests that the origin of such change in coloring is due to the presence of some impurities that act as a catalyst in its molecular oxidation, or it may be attributed to the crystal lattice, which has some contribution in preventing the molecular oxidation at the normal conditions.

Conclusion

Based on the presented results one could conclude that the fractional distillation can also be considered as a powerful tool for purification of organic compounds in solid state as already known for that of liquid state. However, the main deference of applying these common purification methods for solid state in contrast with that of liquid is must be carried out under efficient vacuum with warm condenser. The results also show that the coloring phenomenon of O-bromoaniline is due to presence of impurities. As when be in very pure form it white color remains with no change. The results indicate that the conventional methods for purification of this compound in solid state such as recrystallization do not work efficiently for this specific compound.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

References

[1] L. Fishbein, Aromatic amines, in: E. Atlas, et al. (Eds.), Anthropogenic compounds, Springer-Verlag Berlin Heidelberg (1984) 1-40.

[2] J. Northcott, Aniline and its derivatives, in: R.E. Kirk, D.F. Othmer (Eds.), Encyclopedia of Chemical Technology, 3rd ed., Vol. 2, John Wiley & Sons, New York (1978), 309–321.

[3] R.A. Khalil, A Study of the Factors Affecting Nitrogen-15 Nuclear Magnetic Resonance Chemical Shifts, Ph.D. Thesis, University of Mosul, Iraq (1994).

[4] R. T. Morrison, R. N. Boyd,Organic Chemistry, 3rd ed., Boston: Allyn and Bacon, Inc., (1974) 730.

[5] R.A. Khalil, A.M.A. Saeed, Colorimetric microdetermination of bromhexine drug in aqueous solution, J. Chin. Chem. Soc., 54 (2007) 1099-1105.

[6] R.A. Khalil, R.Z. Al-Khayat, Micellar catalysis in reactions of some β-lactam antibiotics with p-dimethylaminobenzaldehyde. Phys. Chem. Liquids, 46 (2008) 34-46.

[7]Fluka Chemie AG, Industriestrasse 25, CH-9470 Buchs, Switzerland. https://www.sigmaaldrich.com/switzerland-schweiz/standorte.html

[8] D.D. Perrin, W.L.F. Armarego, D.R. Perrin, , Purification of Laboratory Chemicals, 2nd Ed., Oxford: Pergamon Press, (1980).

[9] R.A. Khalil., A New procedure for preparing calcium -D- saccharate from commercial sugar, National J. Chem., 9 (2003) 14-20

HOW TO CITE THIS ARTICLE
Rabah Ali Khalil, The coloring phenomenon of O-bromoaniline, *Prog. Chem. Biochem. Res.* 2020, 3(3), 269-271
DOI: 10.33945/SAMI/PCBR.2020.3.9
URL: http://www.pcbiochemres.com/article_110245.html