

Impact of phase composition on quality of ASN fertilizers

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Ammonium Sulphate Nitrate (ASN) based fertilizers are very efficient fertilizers in modern agriculture. Designed to provide targeted nutrition and high yields, they combine the extended availability of Ammoniacal (NH₄) and rapid effect of Nitrate Nitrogen (NO₃) with the multiple agricultural benefits of Sulphur. Most of these products have some tendency to form agglomerates (caking) and dust during storage in a bulk of hundreds to thousands of tons. The severity of quality deterioration can be influenced by a number of factors, such as phase composition, moisture content, particle structure, mechanical strength, hygroscopic properties, product temperature, ambient conditions, storage time and pressure [1].

ASN fertilizer is mainly a combination of the double salts 3DASA ((NH₄)₅(NO₃)₃SO₄) and 2DASA ((NH₄)₄(NO₃)₂SO₄) [2]. It is known that presence of these mixed salts has a strong impact on the quality of fertilizer. Seeing that X-ray Powder Diffraction Analysis (XRDA) is commonly used to control the quality of industrially produced fertilizers, a new X-ray method has been developed. This new method is based on the determination of the ratio of the integral intensities of the diffraction lines of the 3DASA and 2DASA components. The ratio obtained by line profile analysis provides an effective screening test of the quality of fertilizer immediately after production. In accordance with ratio value it is possible to estimate quality changes of product during long-term storage.

[1] A. O. Gezerman, International Journal of Chemistry 3 (2011) 123.

[2] T. S. Babkina, et. al., Russian Chemical Bulletin, International Edition 61 (2012) 33.