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International Fertiliser Society

21st Annual Conference

Robinson College, Cambridge, UK

12-13 December 2013

Programme

Sponsors

Delegate list

Posters

List of Posters at the International Fertiliser Society Conference, December 2013

1. Effect of Variety, Fertilisation and Crop Protection Protocols on Nutritional Quality of Potato.
   Tounis Abolgasem, E.J. Okello and C. Leifert.

2. Estimating greenhouse gas emissions in controlled traffic farming systems in Australia.
   Diogenes L. Antille, Jeff N. Tullberg, Jochen Eberhard, Chris Bluett, Clemens Scheer, Erik Schmidt.

3. Evaluation of granular and liquid fertilisers as nitrogen sources for plant cane.
   D. L. Antille, P. Pittaway, A. R. Melland, G. Cellotto, J. Dowie, G. Shannon.

4. Take control of N_2O emission by management of soil-pH!
   Lars Bakken.

5. Nitrate content in hop (*Humulus lupulus L.*) cones in relation to fertiliser type, weather conditions and nitrogen application time.
   Barbara Čeh.

6. Grass yield responses to manufactured nitrogen fertiliser at two sites in Central England.
   B J Chambers, M Crookes, H Balshaw and J P Newell Price.

7. Digestate crop available nitrogen supply to winter wheat.
   B J Chambers, M J Taylor, A J Rollett, J P Newell Price and J R Williams.

8. Mechanochemical transformation of phosphates from Chilisay and Karatau (Kazakhstan) and enhancement of fertiliser property.
   N.S. Dalabayeva, G.S. Kuanysheva, B.D. Balgysheva.

9. Quantification of the value of advisory services from fertiliser companies.
   Corrina Gibbs.

10. The influence of additionally mineralised N on crop offtake and its determination by GrowHow N-min in Agrii field trials.
    Laurence Blake, Mechteld M A Blake-Kalff, David Langton, and Allison Grundy.

11. Recent development of the Growhow N_{min}® Test for the determination of Soil Nitrogen Supply (SNS).
    L. Blake, M.M.A Blake-Kalff and A. Grundy.

12. Modelling phosphate uptake and use in wheat.
    S. Payvandi, J. Heppell, D.L Jones, D. Langton, R. Sylvester-Bradley, P. Talboys, P. Withers, K.C. Zygalakis, T. Roose.

13. Evaluation of the GrowHow N-Min service for use in maize cropping.
    Elaine Jewkes, Mechteld Blake-Kalff and Laurence Blake.

14. Online P and K Fertilizer Calculator for grassland and tillage crops in Ireland.
    S.T.J. Lalor, M. Plunkett and J McHoul.

15. Impact of P fertiliser application timing and formulation on dry matter yield and P concentration of grass over two years.
    S.T.J. Lalor, T. Sheil, and D.P. Wall.

Mechanochemical transformation of phosphates from Chilisay and Karatau (Kazakhstan) and enhancement of fertiliser property

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Abstract: *This research provides results regarding the modification of the native phosphates of Karatau and Chilisay with inorganic salts such as $NaHSO_4$ and NaH_2PO_4. The modification of these phosphates takes place in a planetary mill, which produces the necessary fertiliser and inorganic materials.*

After mechanochemical activation the content of P_2O_5 in fertilizer is increased. The kinetics of mechanochemical activation of Chilisay's phosphates with $NaHSO_4$ is characterized and analyzed in chemical compounds of fertiliser.

Key words: fertilization, complex compounds, mechanochemical activation, phosphate ores,

These days, the production of complex phosphate fertilizer is consider to be the paramount concern of foreign and native investors, due to the great demand for complex mineral fertilizers in the Republic of Kazakhstan. Variability in quality of native phosphate ores requires a non-traditional approach in order to find an alternative method of processing fertilizers and inorganic fertilizer materials with useful properties. To solve this problem, particular attention should be paid to mechanically stimulate reactions in the presence of various additives, the implementation of which is environmentally and economically more feasible.

Untreated samples of phosphate have very low concentration of digestible forms of P_2O_5 with Karatau 15,5 per cent and Chilisay 45,8 per cent relative P_2O_5. The digestibility of phosphorus is increased after mechanochemical activation by 2-3 times (Table 1). A centrifugal planetary mill was used as the activator.

Table1–Compound of power digestibility phosphate P_2O_5 (rel.%)

Chilisay		Karatau	
In neutral ammonium citrate	In 2% citric acid	In neutral ammonium citrate	In 2% citric acid
Inactive phosphorus			
45.8	40.2	15.5	47.5
Active with $NaHSO_4$			
65.4 – 85	53.4– 61.2	48.6– 65.4	60.3– 68.6
Active with NaH_2PO_4			
75.8– 80	61.6– 76.5	53.8– 62.0	70.5– 73.2

Dispersed samples of phosphate were determined by two methods. The difference between the electron microscopy and sedimentation analysis techniques was 2-3 per cent. We found that increasing the milling time decreases polydisperse and size of the particle (Figure 1(a,b)).

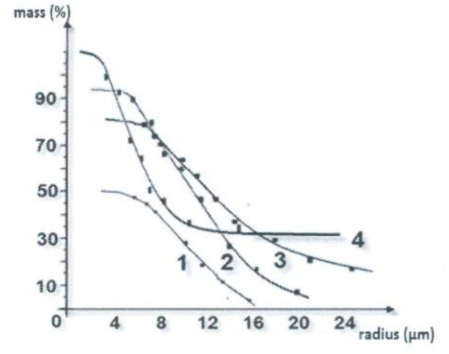	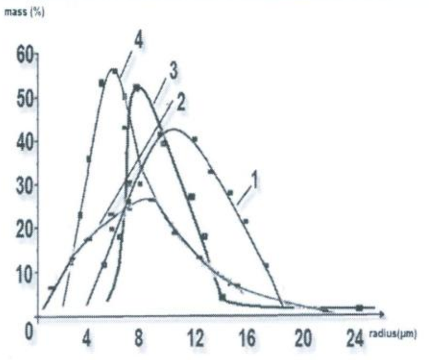
Figure 1(a) – Integral curve on mechanochemical activation of Chilisay phosphate with acid salts (minutes: 1 - 5; 2- 15; 3 – 30; 4 – 45)	**Figure 1(b)** – Differential curve on mechanochemical activation of Chilisay phosphate with acid salts (minutes: 1 - 5; 2- 15; 3 – 30; 4 – 45)

The bond of phosphate with oxygen atoms surrounding the six fold axis forms an equilateral triangle. As a result of mechanochemical activation processing and distortion of the crystal, the symmetry of the triangle is broken. The ionic bond increases between one of the calcium and phosphate ions, as well as conditions of migration of ions changing along the six-fold axis in the structure of phosphorus. When this is implemented it increases the solubility and also the content of P_2O_5 is increased after mechanochemical activation.

References

1. ChaykinaM.V.Mechanochemistry nature and synthetic apatits. - Novosibirsk, 2002. - p. 218.
2. Martin K. Beyer, Hauke Clausen - Schaimann. Chemical review. Vol(105), 2004. 2927.
3. Y.Pelovsky, I. Dombalov. Mechanochemical activation of dolomite. Journal of Thermal analysis and calorimetry. Vol(64), 2001, 1257-1263

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