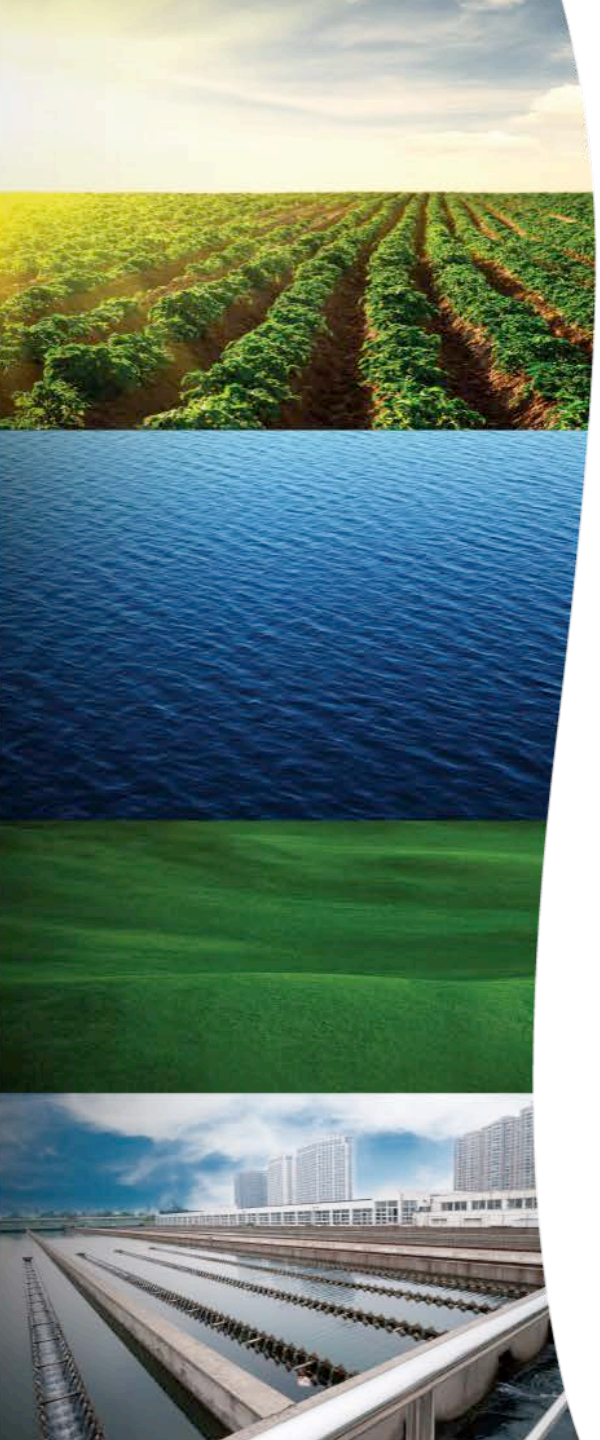


BIO HUMA NETICS®
Incorporated

Micro Carbon Technology

Tom Crawford, Jr, PhD
Global Agronomy LLC

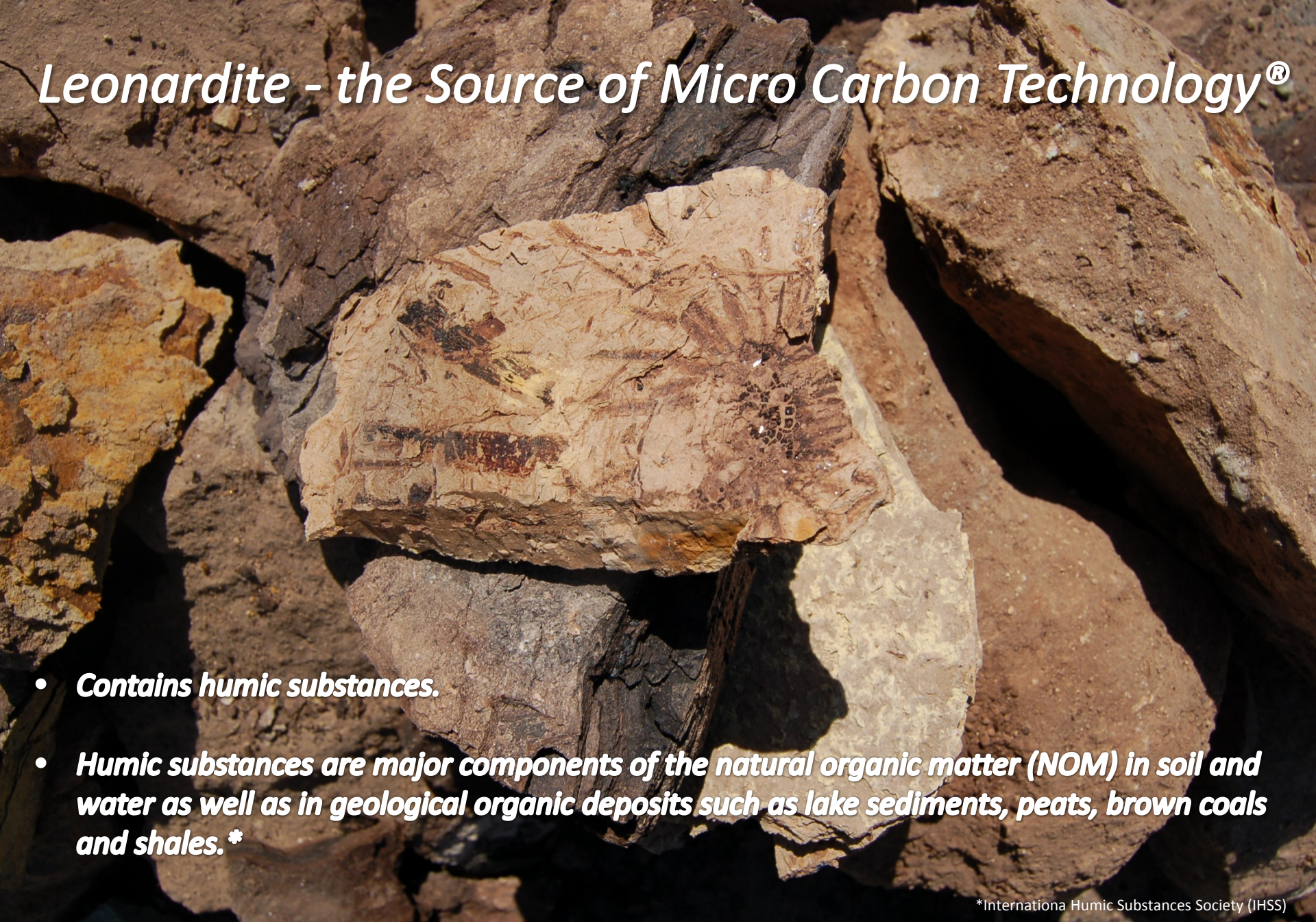
Significance of Micro Carbon Technology®

- Unique properties.
- *The* essential ingredient of all fluid products of Bio Huma Netics, Inc.® (BHN).
- Adds value to BHN products:
  - fertilizers
  - soil improvement products
  - wastewater treatment products
  - organic pesticides
- Provides competitive advantage in global markets.

History of Micro Carbon Technology®

- 1973 - Dr. Jordan Smith, Mr. Don Organ & Mr. Delworth Stout of Sunburst Mining Co. first applied leonardite to agricultural fields.
- 1981 - Sunburst Mining Co. developed proprietary process to extract organic matter from leonardite.
- 1995 - Bio Huma Netics® (BHN) company name registered with U.S. Patent & Trademark Office.
- 2010 - Micro Carbon Technology™ (MCT) concept first used by BHN.
- 2012 - Micro Carbon Technology™ first used in interstate commerce by BHN.
- 2013 - Micro Carbon Technology® registered with U.S. Patent and Trademark Office.

Leonardite - the Source of Micro Carbon Technology®



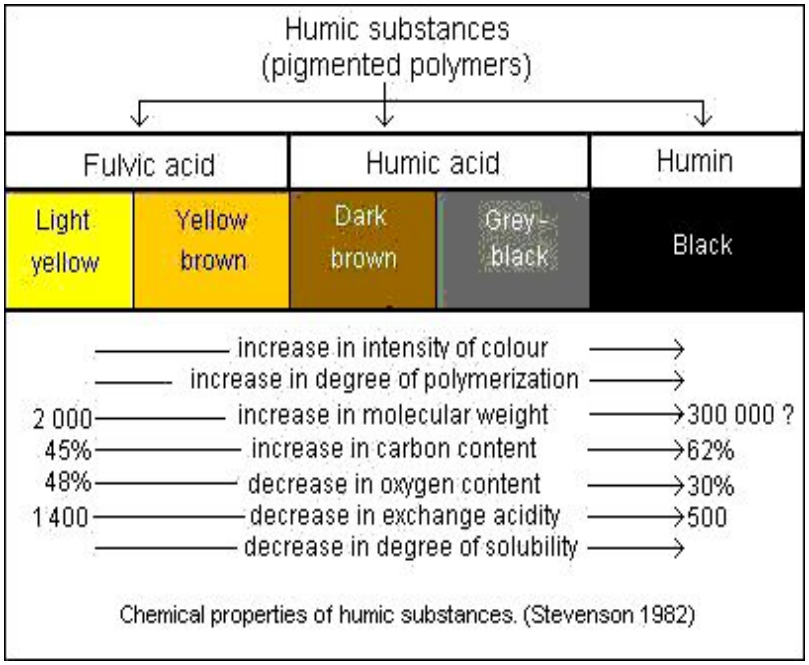
- ***Contains humic substances.***
- ***Humic substances are major components of the natural organic matter (NOM) in soil and water as well as in geological organic deposits such as lake sediments, peats, brown coals and shales.****

*Internationa Humic Substances Society (IHSS)

BHN Leonardite vs Anthracite Coal

BHN Leonardite

Source: M. Boyd



Chemical properties of humic substances. (Stevenson 1982)

Anthracite Coal

Source: Wikipedia

From Leonardite to Micro Carbon Technology® (MCT) and Products that Contain MCT

Leonardite Mine

Leonardite Delivered to BHN

Biological Digestion

(The process is a trade secret)

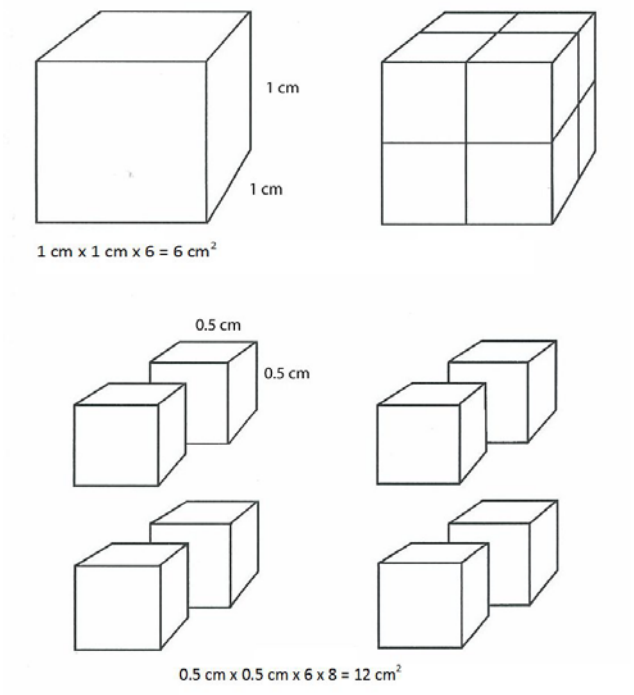
Chemical Extraction

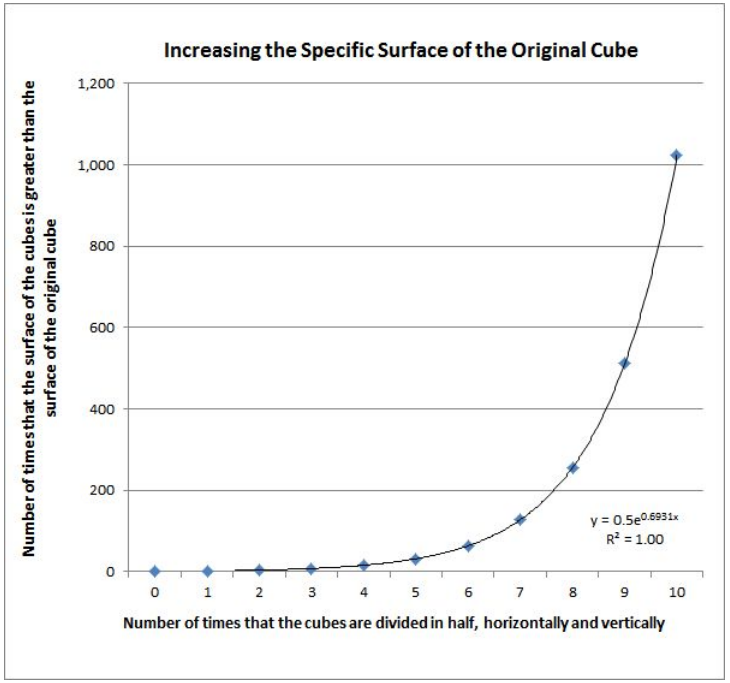
Complexing with Nutrients

products

PROPERTIES OF MICRO CARBON TECHNOLOGY®

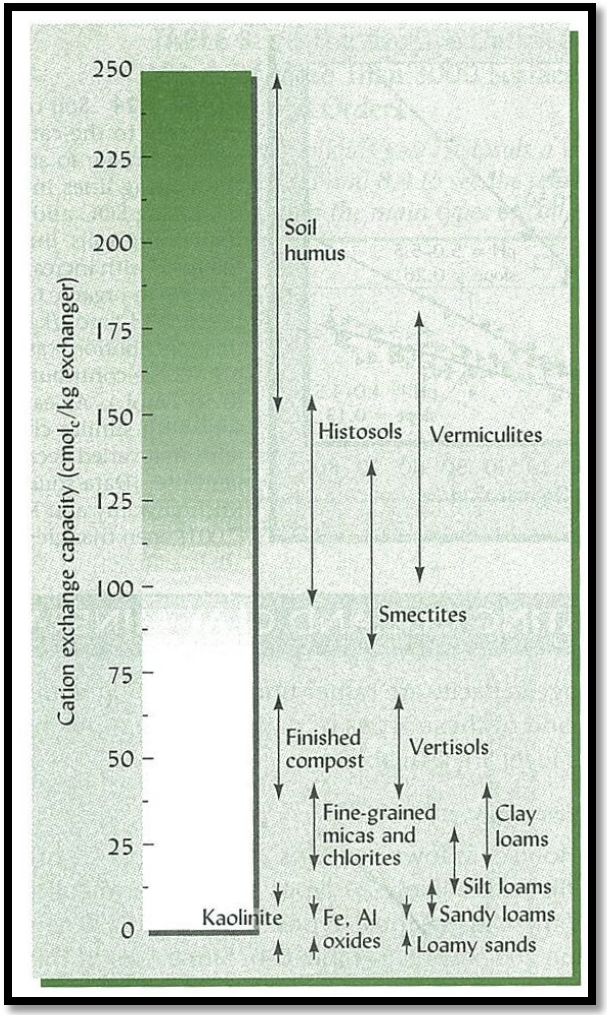
Micro Carbon Technology® Produces Organic Matter with Greater Specific Surface





Source: F.S. Perls, 1969

High Cation Exchange Capacity



Source: Brady and Weil, 2008)

- Humic acid: 500 - 870 cmol$_c$/kg
- Fulvic acid: 900 - 1,400 cmol$_c$/kg
- Micro Carbon Technology®: A Complex Mixture of Natural Organic Molecules More Chemically Active than Untreated Humic and Fulvic Acids of Leonardite.

Functional Groups of Humic and Fulvic Acids that Contain Oxygen

	Total Acidity or Cation Exchange Capacity	-COOH	Acid -OH	Weakly Acid and Alcolholic -OH	-C=O
	Normal Range, cmol(+) per kg				
Humic Acids	500-870	150-300	250-570	270-350	90-300
Fulvic Acids	900-1,400	610-910	270-670	330-490	110-310

Source: Stevenson y Butler, 1969

Micro Carbon Technology® is a Complex Mixture of Natural Organic Molecules More Chemically Active than Untreated Humic and Fulvic Acids of Leonardite.

Micro Carbon Technology® includes interaction of organic matter with:

- Inorganic, cationic nutrients of plants and microorganisms
- Inorganic, anionic nutrients of plants and microorganisms
- Organic (carbon-containing) nutrients of plants and microorganisms

The 17 Essential Metallic and Non-Metallic Nutrients of Plants and Microorganisms

PERIODIC TABLE OF THE ELEMENTS

Ia	2a	3b	4b	5b	6b	7b	8	1b	2b	3a	4a	5a	6a	7a	0	Orbit
1 +1 −1 H 1.0080 1		KEY TO CHART: Atomic Number → 50 +2 +4 Sn 118.69 ← Oxidation States; Symbol →; Atomic Weight → −18−18−4 ← Electron Configuration								5 +3 B 10.81 2-3	6 +2 +4 −4 C 12.011 2-4	7 +1 +2 +3 +4 +5 −1 N 14.0067 2-5	8 −2 O 15.9994 2-6	9 −1 F 18.99846 2-7	10 0 Ne 20.17₀ 2-8	K L
3 +1 Li 6.94₁ 2 1	4 +2 Be 9.01218 2 2															
11 +1 Na 22.98977 2-8 1	12 +2 Mg 24.305 2 8 2	Transition Elements					Group 8		Transition Elements	13 +3 Al 26.9815 2-8-3	14 +2 +4 −4 Si 28.086 2-8-4	15 +3 +5 −3 P 30.9738 2-8-5	16 +4 +6 −2 S 32.06 2-8-6	17 +1 +5 +7 −1 Cl 35.453 2-8-7	18 0 Ar 39.948 2-8-8	K-L-M
19 +1 K 39.10₂ 8-8-1	20 +2 Ca 40.08 -8-8-2	21 +3 Sc 44.9559 -8-9-2	22 +2 +3 +4 Ti 47.90 8 10 2	23 +2 +3 +4 +5 V 50.941₄ 8 11 2	24 +2 +3 +6 Cr 51.996 -8-13-1	25 +2 +3 +4 +7 Mn 54.9380 -8-13 2	26 +2 +3 Fe 55.847 -8-14-2	27 +2 +3 Co 58.9332 8 15 2	28 +2 +3 Ni 58.71 8-16-2	29 +1 +2 Cu 63.546 8-18-1	30 +2 Zn 65.38 -8-18-2	31 +3 Ga 69.72 -8-18-3	32 +2 +4 Ge 72.59 -8-18-4	33 +3 +5 −3 As 74.9216 -8-18-5	34 +4 +6 −2 Se 78.96 -8-18 6	35 +1 +5 −1 Br 79.904 -8-18-7	36 0 Kr 83.80 -8-18-8	L-M-N
37 +1 Rb 85.467₈ -18-8-1	38 +2 Sr 87.62 -18-8-2	39 +3 Y 88.9059 18-9-2	40 +4 Zr 91.22 -18-10-2	41 +3 +5 Nb 92.9064 -18-12-1	42 +6 Mo 95.94 18 13-1	43 +4 +6 +7 Tc 98.9062 -18-13-2	44 +3 Ru 101.07 -18-15-1	45 +3 Rh 102.9055 -18-16-1	46 +2 +4 Pd 106.4 18-18-0	47 +1 Ag 107.868 -18-18-1	48 +2 Cd 112.40 -18-18-2	49 +3 In 114.82 -18-18-3	50 +2 +4 Sn 118.69 -18-18-4	51 +3 +5 −3 Sb 121.75 -18-18-5	52 +4 +6 −2 Te 127.60 -18-18-6	53 +1 +5 +7 −1 I 126.9045 -18-18-7	54 0 Xe 131.30 -18-18-8	M-N-O
55 +1 Cs 132.9055 -18-8-1	56 +2 Ba 137.34 -18-8-2	57* +3 La 138.9055 -18-9-2	72 +4 Hf 178.49 -32-10-2	73 +5 Ta 180.947₉ -32-11-2	74 +6 W 183.85 -32-12-2	75 +4 +6 +7 Re 186.2 -32-13-2	76 +3 +4 Os 190.2 -32-14-2	77 +3 +4 Ir 192.22 -32-15-2	78 +2 +4 Pt 195.09 -32-16-2	79 +1 +3 Au 196.9665 32-18-1	80 +1 +2 Hg 200.59 -32-18-2	81 +1 +3 Tl 204.37 -32-18 3	82 +2 +4 Pb 207.2 -32-18-4	83 +3 +5 Bi 208.9806 -32-18-5	84 +2 +4 Po (209) -32-18 6	85 At (210) -32-18-7	86 0 Rn (222) -32-18-8	N-O-P
87 +1 Fr (223) -18-8-1	88 +2 Ra (226) -18-8 2	89** +3 Ac (227) -18-9-2	104 — 32-10-2	105 —												O-P-Q

Metallic Essential Nutrients

Non-Metallic Essential Nutrients

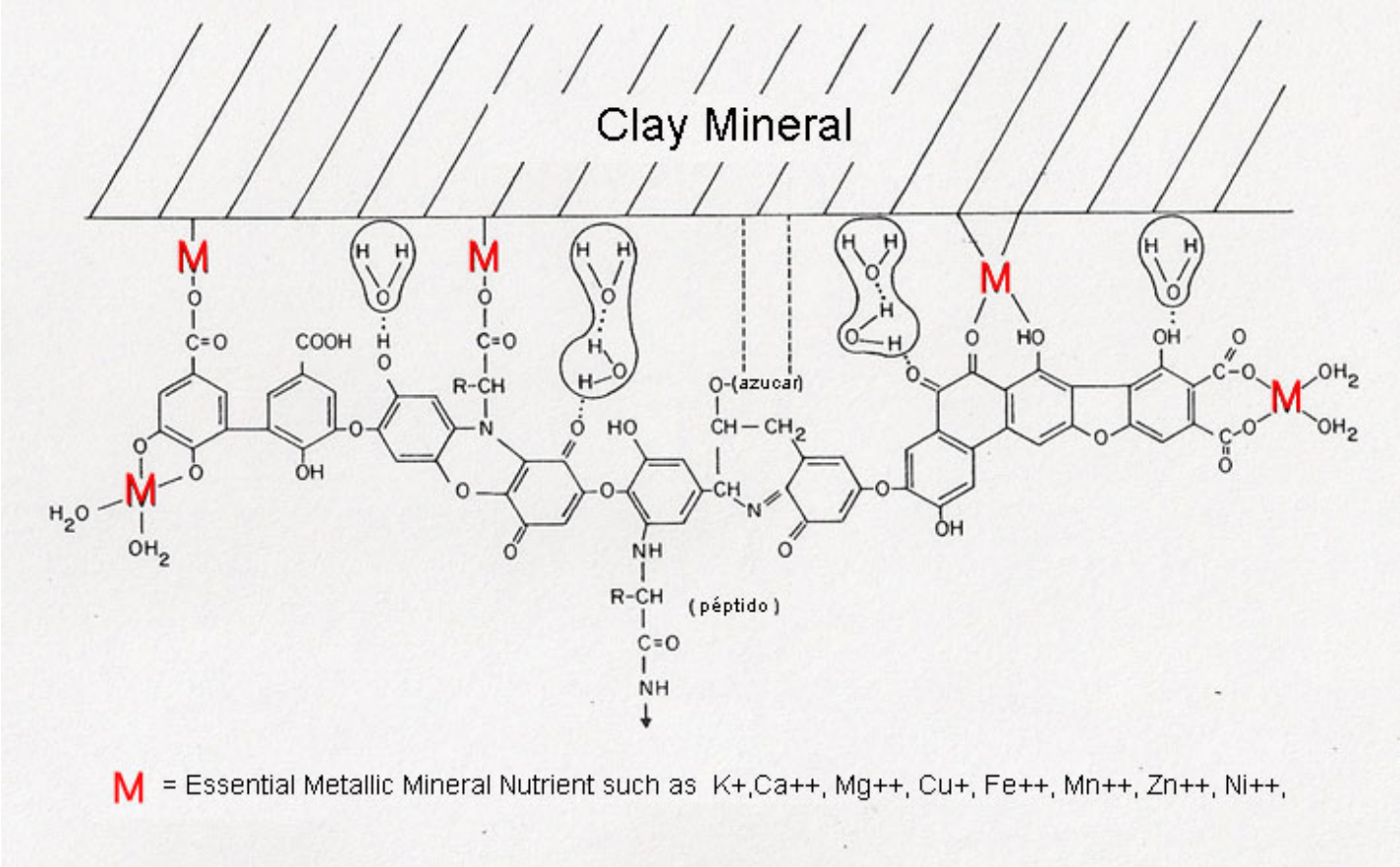
*Lanthanides	58 +3 +4 Ce 140.12 -20-8-2	59 +3 Pr 140.9077 -21-8-2	60 +3 Nd 144.24 -22-8 2	61 +3 Pm (145) -23-8-2	62 +2 +3 Sm 150.4 -24-8-2	63 +2 +3 Eu 151.96 -25-8-2	64 +3 Gd 157.25 -25-9-2	65 +3 Tb 158.9254 -27-8-2	66 +3 Dy 162.50 -28-8-2	67 +3 Ho 164.9303 -29-8-2	68 +3 Er 167.26 -30-8-2	69 +3 Tm 168.9342 -31-8-2	70 +2 +3 Yb 173.04 -32-8-2	71 +3 Lu 174.97 -32-9-2	N-O-P
**Actinides	90 +4 Th 232.0381 -18-10-2	91 +5 Pa +4 231.0359 -20-9-2	92 +3 +4 +5 +6 U 238.029 -21-9-2	93 +3 +4 +5 +6 Np 237.0482 -22-9-2	94 +3 +4 +5 +6 Pu (244) -24-8-2	95 +3 +4 +5 +6 Am (243) -25-8-2	96 +3 Cm (247) -25-9-2	97 +3 +4 Bk (247) -27-8-2	98 +3 Cf (251) -28-8-2	99 Es (254) -29-8-2	100 Fm (257) -30-8-2	101 Md (256) -31-8-2	102 No (254) -32-8-2	103 Lr -32-9-2	O-P-Q

Numbers in parentheses are mass numbers of most stable isotope of that element.

Sources: Handbook of Chemistry and Physics, 54th ed. and Epstein and Bloom, 2005

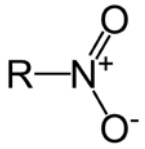
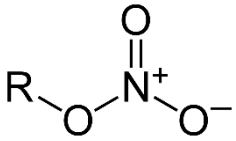
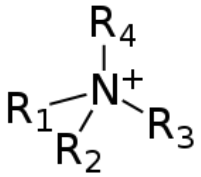
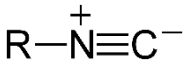
Clay-Metal-Organic Matter Complexes in Soil

Structures and functional groups such as those of Micro Carbon Technology®



Source: FJ Stevenson and MS Ardakani. 1972. Organic Matter Reactions Involving Micronutrients in Soils. *In* JJ Mordtvedt, PM Giordano and WL Lindsay (eds.) Micronutrients in Agriculture. Soil Science Society of America, Madison, Wisconsin.

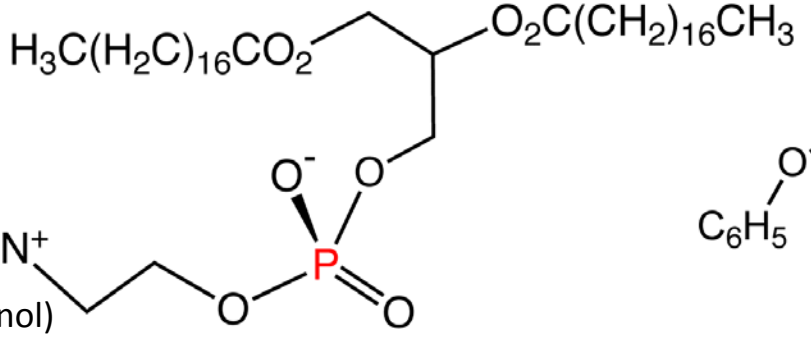
Positively Charged Functional Groups Can React with Non-Metallic Nutrients of Plants and Microorganisms

Nitro compound	$-RNO_2$	nitro-	
Nitrate compound	$-RONO_2$	nitrooxy-, nitroxy-	
Quaternary ammonium cation	$-R4N^+$	ammonio-	
Isonitrile	-RNC	isocyano-	

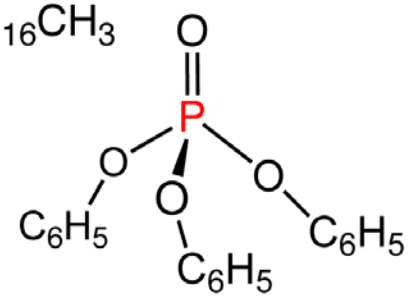
Source: Wikipedia

Examples of the Interaction of Phosphate with Organic (Carbon-containing) Substances

(Aliphatic glycerol)

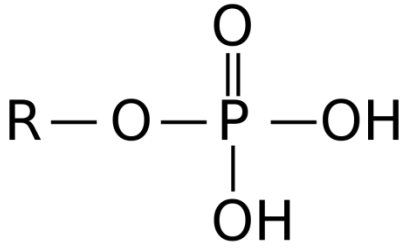


(Trimethyl ammonium ethanol)



(Aromatic phenyl groups)

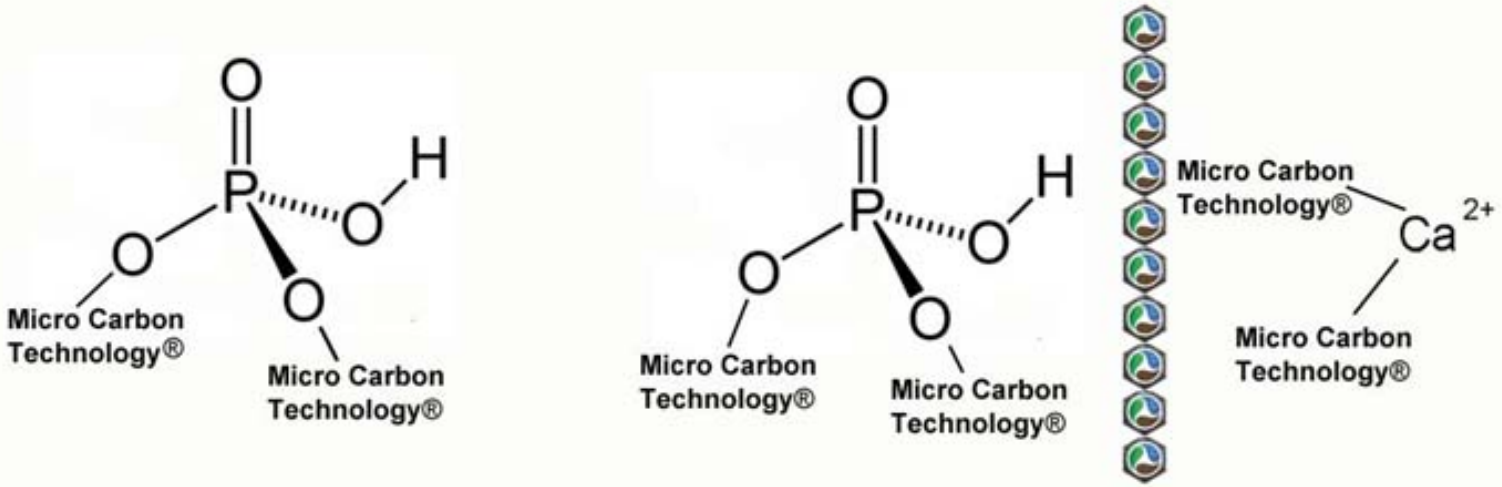
Phosphate esters*



*An ester is formed by condensation of an acid and an alcohol.

(Hypothetical) Increased Availability of P from Super Phos®, in Comparison with Conventional P Fertilizers

Phosphoric acid protected by Micro Carbon Technology® of Super Phos®



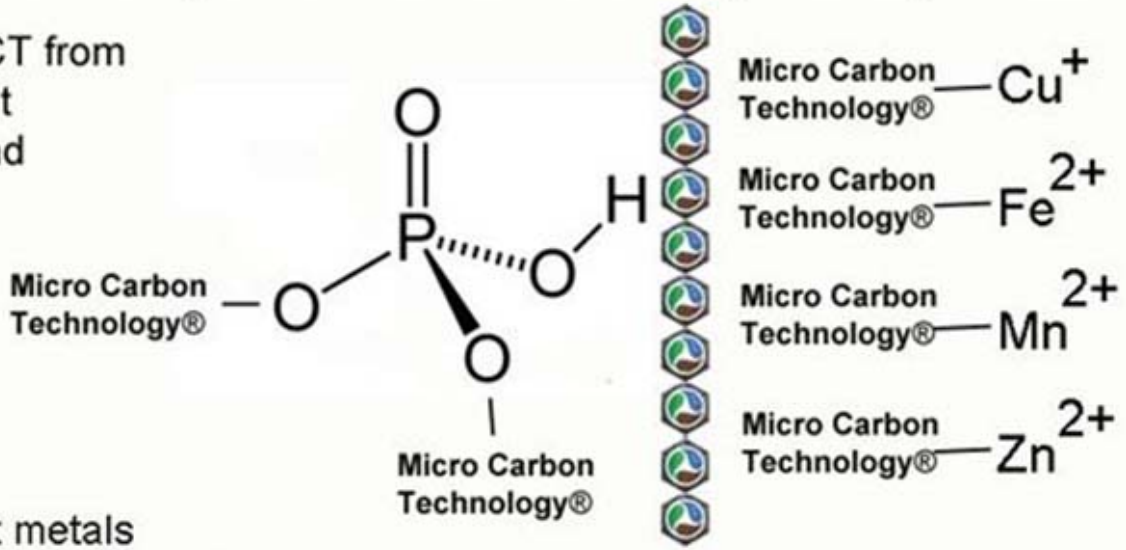
. . . is protected by MCT from precipitation with calcium . . .

. . . making phosphorus more available for absorption by the plant.

(Hypothetical) Increased Availability of Micronutrient Metals and P from Super Phos®, in Comparison with Conventional P Fertilizers

Micronutrient metals are protected by Micro Carbon Technology® of Super Phos®

Phosphate is protected by MCT from precipitation with micronutrient metals such as Cu, Fe, Mn and Zn . . .



. . . making the micronutrient metals more available for absorption by the plant.

Some Parting Thoughts

- Micro Carbon Technology® is based on interactions of molecules of organic (carbon-containing) matter of relatively small molecular weight interacting with inorganic elements and compounds.

- The benefits of Micro Carbon Technology® result from the interactions of MCT with the other ingredients of BHN products and the target organisms (plants or microorganisms) to which the products are applied.

- The success of Micro Carbon Technology® is affected by interactions of MCT with 1) other substances being applied and 2) the target organisms and 3) many other factors in the environment.

Thank you

Source: www.lematin.ma

Global Agronomy LLC contact: +1 256-394-8305 or globalagronomy@gmail.com