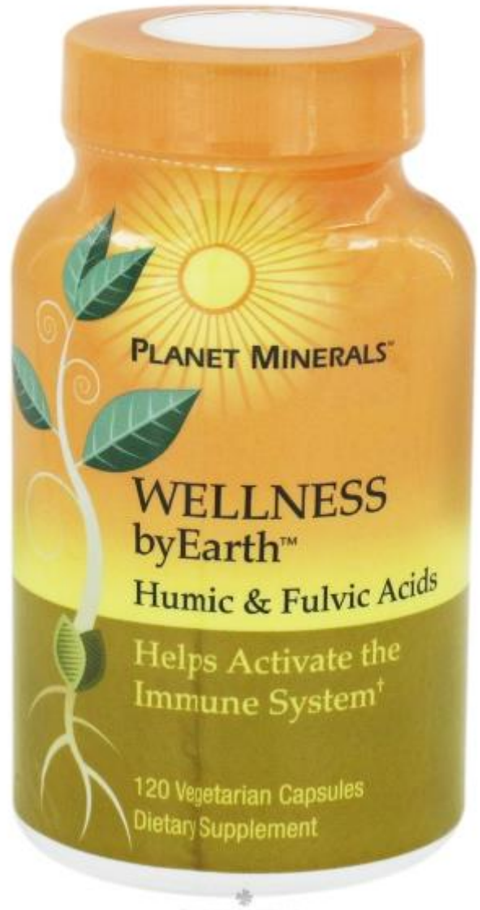
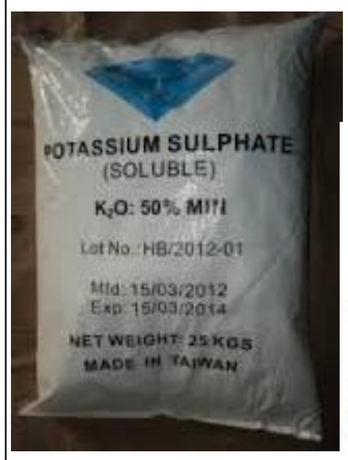
SODIUM HUMATE
ORGANIC AND MINERAL FERTILIZER

ECO FRIENDLY BIOLOGICAL TECHNOLOGIES

DESIGN CRITERIA

LIGNO-HUMATE EXCELLENT SOIL CONDITIONER





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15 Feb 2015	O.SONGUR		J.Dusembaeva	N/S

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Humic acid *is a principal component of humic substances, which are the major organic constituents of soil (humus), peat, coal, many upland streams, dystrophic lakes, and ocean water.[1] It is produced by biodegradation of dead organic matter. It is not a single acid; rather, it is a complex mixture of many different acids containing carboxyl and phenolate groups so that the mixture behaves functionally as a dibasic acid or, occasionally, as a tribasic acid. Humic acids can form complexes with ions that are commonly found in the environment creating humic colloids. Humic and fulvic acids (fulvic acids are humic acids of lower molecular weight and higher oxygen content than other humic acids) are commonly used as a soil supplement in agriculture, and less commonly as a human nutritional supplement. As a nutrition supplement, fulvic acid can be found in a liquid form as a component of mineral colloids. Fulvic acids are poly-electrolytes and are unique colloids that diffuse easily through membranes whereas all other colloids do not. "Synthesis of fulvic acid (1a) was accomplished by a route involving selective ozonization of 9-propenylpyranobenzopyran (1c), obtained by a regioselective cyclization of the 2-methylsulphinylmethyl 1,3-dione(3c)."[2]*

Formation and description

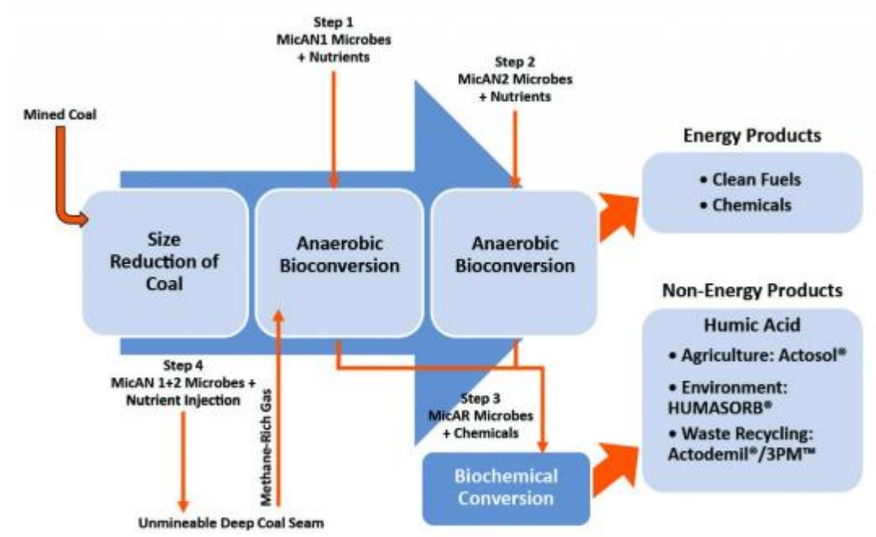
Humic substances are formed by the microbial degradation of dead plant matter, such as lignin. They are very resistant to further biodegradation. The precise properties and structure of a given sample depend on the water or soil source and the specific conditions of extraction. Nevertheless, the average properties of humic substances from different sources are remarkably similar.

Humic substances in soils and sediments can be divided into three main fractions: humic acids, fulvic acids, and humin. The humic and fulvic acids are extracted as a colloidal sol from soil and other solid phase sources into a strongly basic aqueous solution of sodium hydroxide or potassium hydroxide. Humic acids are precipitated from this solution by adjusting the pH to 1 with hydrochloric acid, leaving the fulvic acids in solution. This is the operational distinction between humic and fulvic acids. Humin is insoluble in dilute alkali. The alcohol-soluble portion of the humic fraction is, in general, named ulmic acid. So-called "gray humic acids" (GHA) are soluble in low-ionic-strength alkaline media; "brown humic acids" (BHA) are soluble in alkaline conditions independent of ionic strength; and fulvic acids (FA) are soluble independent of pH and ionic strength.[3]

Liquid chromatography and liquid-liquid extraction can be used to separate the components that make up a humic substance. Substances identified include mono-, di-, and tri-hydroxy acids, fatty acids, dicarboxylic acids, linear alcohols, phenolic acids, and terpenoids.[4]

TYPICAL ANALYSIS OF actosol® PRODUCTS (w/v%)

	HUMIC ACID	N	P (P_2O_5)	K (K_2O)	Ca	Mg	S	B	Cl	Cu	Fe	Mn	Zn
Turf Booster actosol®	3	20	5	5	0.08	0.07	.10	0.007	0.5	0.01	0.1	0.01	0.01
Horticultural actosol®	3	10	10	10	0.08	0.07	.10	0.007	0.5	0.01	0.1	0.01	0.01
Calcium actosol®	3	2	-	-	2.00	0.07	.10	0.007	0.5	0.01	0.1	0.01	0.01
Micronutrient actosol®	3	0.4	0.08	.5	0.08	0.07	.10	0.007	0.5	0.5	0.5	0.5	0.5
Bio-Activated Base actosol®	6	0.4	0.08	1.5	0.08	0.07	.10	0.007	0.5	0.01	0.5	0.01	0.01



APPLICATIONS OF *actosol®* HUMIC ACID

- ☑ Agriculture
- ☑ Horticulture
- ☑ Floriculture
- ☑ Turf Management/Maintenance
- ☑ Mine/Landfill Reclamation
- ☑ Dune Stabilization
- ☑ Road/Highway Erosion Control
- ☑ Hydroseeding
- ☑ Pasture Land, Conservation of Natural Resources

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ORGANIC MATTER, HUMUS, HUMATE, HUMIC ACID, FULVIC ACID AND HUMIN: THEIR IMPORTANCE IN SOIL FERTILITY AND PLANT HEALTH

Humic substances, such as those listed in the above title, play a vital role in soil fertility and plant nutrition. Plants grown on soils which contain adequate humin, humic adds (HAs), and fulvic adds (FAs) are less subject to stress, are healthier, produce higher yields; and the nutritional quality of harvested foods and feeds are superior. The value of humic substances in soil fertility and plant nutrition relates to the many functions these complex organic compounds perform as a part of the life cycle on earth. The life death cycle involves a recycling of the carbon containing structural components of plants and animals through the soil and air and back into the living plant.

Man became distracted from the importance of organic compound cycling when it was discovered that soluble acidic based N P K "fertilizers" could stimulate plant growth. Large industrial concerns took advantage of the N P K discovery to market industrially processed "fertilizers" from mineral deposit. Continued use of these acidic fertilizers in the absence of adequate humic substances (in the soil) has caused many serious sociological and ecological problems. Man needs to reconsider his approach to fertilization techniques by giving higher priority to soil humus.

The urgency to emphasize the importance of humic substances and their value as fertilizer ingredients has never been more important than it is today. All those concerned about the ability of soils to support plant growth need to assist in educating the public. Humic substances are recognized by most soil scientists and agronomists as the most important component of a healthy fertile soil. To illustrate how humic substances function, the following summary, based on published scientific data, has been prepared as a guide for an educational program. In addition, by understanding how these carbon containing substances function, professionals will have a solid foundation on which to design environmentally acceptable sustainable agriculture programs.

ORGANIC MATTER *Organic matter is defined as a grouping of carbon containing compounds which have originated from living beings and deposited on or within the earth's structural components. Soil organic matter includes the remains of all plant and animal bodies which*

have fallen on the earth's surface or purposely applied by man in the form of organically synthesized pesticides. A fertile soil should contain from 2 8 percent organic matter, most soils contain less than 2%. In acid, leached soils, which are often sandy, substantial portions of the organic matter is in the form of plant debris and fulvic acids (FAs). In neutral and alkaline soils a large percentage of the organic matter is present in the form of humic acids (HAs) and humin.

When organic matter is burned, there remains a residual ash. The residual ash is composed of the minerals, trace elements required by plants and animals during their normal growth processes. Thus organic matter contains mineral elements required by plants.

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An accurate measurement of the organic matter content of the soil would be helpful in monitoring soil fertility. Currently the best extractant for removing organic matter from a soil is 0.5 normal sodium hydroxide (NaOH) (working under N2). The second best extractant is sodium pyrophosphate decahydrate (Na4P2O7 10H2O (pH 9.8)). Neither one of these extractants is able to remove all of the organic matter from a soil sample. Obviously since these chemicals are the best extracts known it is impossible to determine the exact amount of organic matter present within a soil. In realty soil organic matter is not a measurable soil component The organic matter content of a soil sample, reported on soil tests, is only an estimate. The organic carbon content of a soil can be measured and would be a much more valuable indication of the potential humic chemistry of a soil. The soils carbon content would be a desirable part of a soil test report

HUMUS *Humus is defined as a brown to black complex variable of carbon containing compounds not recognized under a light microscope as possessing cellular organization in the form of plant and animal bodies. Humus is separated from the non humic substances such as carbohydrates (a major fraction of soil carbon), fats, waxes, alkanes, peptides, amino acids, proteins, lipids and organic acids by the fact that distinct chemical formulae can be written for these non humic substances. Most small molecules of non humic substances are rapidly degraded by microorganisms within the soil. In contrast soil humus is slow to decompose (degrade) under natural soil conditions. When in combination with soil minerals soil humus can persist in the soil for several hundred years. Humus is the major soil organic matter component, making up 65% to 75% of the total. Humus assumes an important role as a fertility component of all soils, far in excess of the percentage contribution it makes to the total soil mass.*

HUMIC SUBSTANCES *Humic substances are the components of humus and as such are high molecular weight compounds that together form the brown to black hydrophilic, molecularly flexible, polyelectrolytes called humus. Many of the components of humus are heterogenous, relatively large stable organic complexes. They function to give the soil structure, porosity, water holding capacity, cation and anion exchange, and are involved in the chelation of mineral elements. The elemental analysis of humic substances reveals that they are primarily composed of carbon, oxygen, hydrogen, nitrogen, and sulfur in complex carbon chains (aliphatic components that make up approximately 40% 50% of the total) C C C C and 4, 5, and 6 member carbon rings (aromatic components that make up 35 60% of the total) with C C, C N and C=O groupings.*

http://www.humates.com/pdf/ORGANICMATTERPettit.pdf

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ORGANIC MATTER, HUMUS, HUMATE, HUMIC ACID, FULVIC ACID AND HUMIN: THEIR IMPORTANCE IN SOIL FERTILITY AND PLANT HEALTH

Preliminary understandings about how humic substances are formed is based on 4 published theories: (1) Lignin modification, (2) Quinone Amino Acid Interaction, (3) Microbial Synthesis of Aromatics, and (4) The Mallard Reaction (a sugar amino acid reaction sequence). Each theory describes complicated biotic and abiotic reactions in which a variety of organic compounds, such as phenolic compounds (eg. lignins), complex carbohydrates, and nitrogenous substances are resynthesized to form large complex polymers. In order for these polymerization reactions to proceed inorganic mineral catalysts must be present. Therefore, the availability of trace minerals is a requirement for the formation of humic substance. The extreme variability in the molecular features of humic substances relates back to the precursor compounds and the environmental conditions under which the humic substances formed. Humic substances have been shown to contain a wide variety of molecular components. Some typical components are: polysaccharides; fatty acids; polypeptides; lignins; esters; phenols; ethers; carbonyls; quinones; lipids: peroxides; various combination of benzene, acetal, ketal, and lactol, and furan ringed compounds; and aliphatic (carbon chains) compounds. The oxidative degradation of some humic substances produces aliphatic, phenolic, and benzenecarboxylic acids in addition to n alkanes and n fatty acids. The major phenolic acids released contain approximately 3 hydroxyl (OH) groups and between 1 and 5 carboxyl (COOH) groups.

Humic substances can be subdivided into three major fractions (1) ***HUMIN****, (2)* ***HUMIC ACIDS*** *(HAs), and (3)* ***FULVIC ACIDS*** *(FAs). These sub divisions are arbitrarily based on the solubility of each fraction in water adjusted to different acid alkaline (pH levels) conditions. Some of the major features of humic substances are summarized in Figure 1.*

HUMINS *Humins are that fraction of humic substances which are not soluble in alkali (high pH) and am not soluble in acid (low pH). Humins are not soluble in water at any pH. Humin complexes are considered macro organic (very large) substances because their molecular weights (MW) range from approximately 100,000 to 10,000,000. In comparison the molecular weights of carbohydrates (complex sugars) range from approximately 500 to 100,000. The chemical and physical properties of humins are only partially understood. Humins present within the soil is the most resistant to decomposition (slow to breakdown) of all the humic substances. Some of the main functions of humins within the soil are to improve the soil's water holding capacity, to improve soil structure, to maintain soil stability, to function as an cation exchange system, and to generally improve soil fertility. Because of these important functions humin Is a key component of fertile soils.*

HUMIC ACIDS Humic acids (HAs) comprise a mixture of weak aliphatic (carbon chains) and aromatic (carbon rings) organic acids which are not soluble in water under acid conditions but are soluble in water under alkaline conditions. Humic acids consist of that fraction of humic substances that are precipitated from aqueous solution when the pH is decreased below 2. Humic acids (HAs) are termed polydisperse because of their variable chemical features. From a three dimensional aspect these complex carbon containing compounds are considered to be flexible linear polymers that exist as random coils with cross linked bonds. On average 35% of the humic acid (HA) molecules are aromatic (carbon rings), while the remaining components

are in the form of aliphatic (carbon chains) molecules. The molecular size of humic acids (HAs) range from approximately 10,000 to 100,000. Humic acid (HA) polymers readily bind clay minerals to form stable organic clay complexes. Peripheral pores in the polymer are capable of accommodating (binding) natural and synthetic organic chemicals in a lattice (clathrate) type arrangements.

HUMIC ACIDS *(**HAs**) readily form salts with inorganic trace mineral elements. An analysis of extracts of naturally occurring humic acids (HAs) will reveal the presence of over 60 different mineral elements present. These trace elements are bound to humic add molecules in a form that can be readily utilized by various living organisms. As a result humic acids (HAs) function as important ion exchange and metal complexing (chelating) systems.*

FULVIC ACIDS *(**FAs**) are a mixture of weak aliphatic and aromatic organic acids which are soluble in water at all pH conditions (acidic, neutral and alkaline). Their composition and shape is quite variable. The size of fulvic acids (HFs) are smaller than humic adds (HAs), with molecular weights which range from approximately 1,000 to 10,000. Fulvic acids (FAs) have an oxygen content twice that of humic acids (HAs). They have many carboxyl (COOH) and hydroxyl (COH) groups, thus fulvic acids (FAs) are much more chemically reactive. The exchange capacity of fulvic acids (FAs) is more than double that of humic acids (HAs). This high exchange capacity is due to the total number of carboxyl (COOH) groups present. The number of carboxyl groups present in fulvic acids (FAs) ranges from 520 to 1120 cmol (H+)/kg. Fulvic acids collected from many different sources and analyzed, show no evidence of methoxy groups (CH3) groups, they are low in phenols, and are less aromatic compared to humic acids from the same sources.*

Because of the relatively small size of fulvic acid (FA) molecules they can readily enter plant roots, stems, and leaves. As they enter these plant parts they carry trace minerals from plant surfaces into plant tissues. Fulvic acids (FAs) are key ingredients of high quality foliar fertilizers. Foliar spray applications containing fulvic acid (FA) mineral chelates, at specific plant growth stages, can be used as a primary production technique for maximizing the plants productive capacity. Once applied to plant foliage fulvic acids (FAs) transport trace minerals directly to metabolic sites in plant cells. Fulvic acids (FAs) are the most effective carbon containing chelating compounds known. They are plant compatible, thus non toxic, when applied at relatively low concentrations.

http://www.humates.com/pdf/ORGANICMATTERPettit.pdf

http://www.teravita.com/Humates/Chapter1.htm

http://russianpatents.com/patent/231/2310633.html

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ORGANIC MATTER, HUMUS, HUMATE, HUMIC ACID, FULVIC ACID AND HUMIN: THEIR IMPORTANCE IN SOIL FERTILITY AND PLANT HEALTH

How to produce Potassium Humate

HTTP://WWW.CNHUMICACID.COM/HOW-TO-PRODUCE-POTASSIUM-HUMATE/

What is potassium humate

*Potassium humate is one of important humate acid salts,which is always called humate,is the final product when **leonardite or lignite** treated with alkaline.*

Difference between humic acid and humate

1-Humic acid has big molecule weight and not soluble in water,slightly soluble in alkalin solution.
2-Humate is salt of humic acid is complete soluble in water

*In order to be soluble, humates in raw form such as lignite or leonardite must go through an alkaline extraction process. Any of the salts like potassium hydroxide, **sodium hydroxide or ammonium hydroxide** can be used as the extractant. The potassium hydroxide extracted form is preferred for fertilizing application as potassium hydroxide (the extractant) is acceptable to many of the organic registration bodies while sodium hydroxide and ammonium hydroxide are not. Due to the low use rate of soluble humates they are not used as a main source of potassium for crops. The potassium is only there as a result of the extractant used. We do not advise increasing the level of potassium beyond what is already in our product as it will raise the pH and place the product in the "**Dangerous Goods**" category for transport which is much more costly. If you require potassium for the crop we recommend using normal potassium sulfate applied with a 5% inclusion of Soluble Humate Granules.*

Manufacturing process

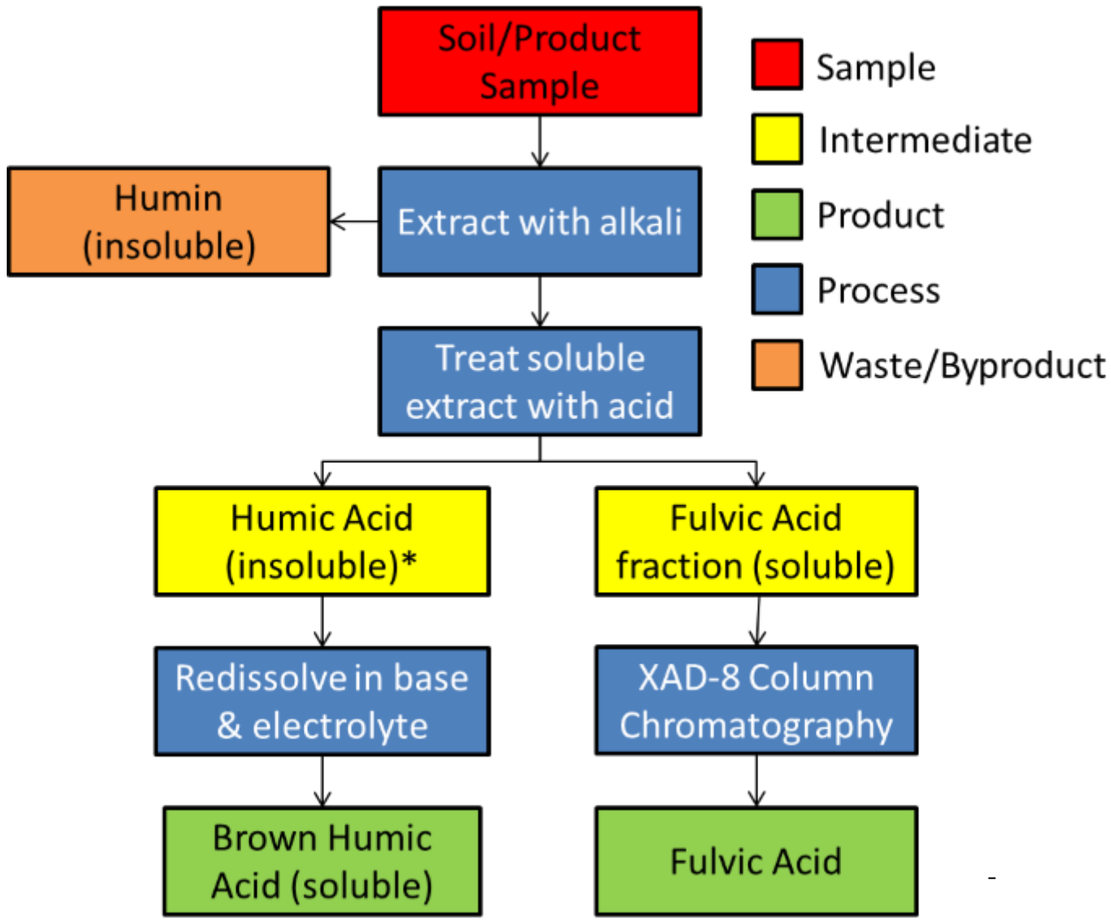
*1.0 **Raw material***
1.1 Select leonardite or lignite
1.2 Natural oxidization for more than 3 month
1.3 Crushing into fine powder
*2.0 **Chemical reaction***
2.1 Supply raw material to reaction tank
2.2 Treat humic acid raw material with alkaline (KOH) at certain ratio under high pressure and temperature,complete reaction.
*3.0 **Sedimentation***
3.1 Transfer the dilution into first-sedimentation tank keep still for sometime separate humin and other impurities,then pump into second sedimentation tank.
*4.0 **Filtering***
4.1 Pump the dilution after sedimentation into centrifugal constantly to get high purity humate liquid.
*5.0 **Three type of Drying***
5.1 Flake type through rolling drying machine
5.2 Powder type through spray tower.
5.3 Solar drying into crystal form

Functions

1.Could be used as additive for fertilizer to promote plants growth and increase soil fertility.
2.Animal feed .For poultry fish crab and so on
3.Industrial use. Used as coke binder
4.Ceramics additive
5.Oil drilling agent

Guidance for agriculture use

*Potassium humate is strongly recommended used with Urea **MAP DAP** and **MKP**. Potassium humate could largely stabilize nitrogen and release lock up phosphorus in soil and increase soil water holding capacity,also will help to create optimal structure of soil for plants to absorb micro elements and other nutrients,block the heavy metals absorbed by plants thus stopped transfer to human.*
Application Dosage 5% of the total blen



http://dirtmd.com/standard-humic-acid-testing-protocols-a-review/

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HUMIC ACID-FULVIC ACID AND HUMIN PRODUCTION PROCESS

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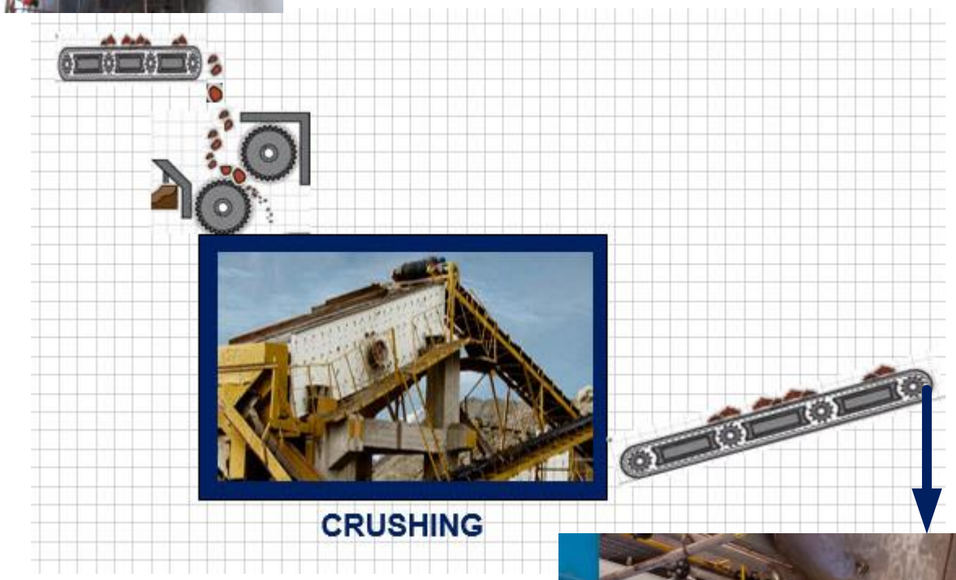


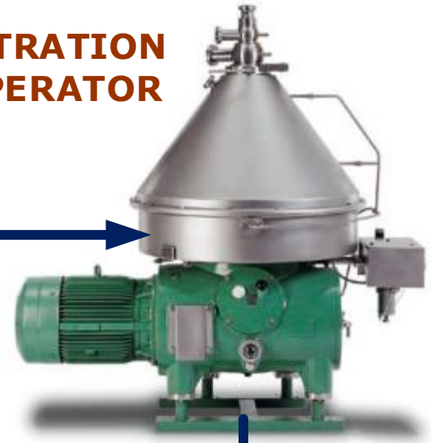
K OR Na

EXTRACTION

SOLVENT EXTRACTION

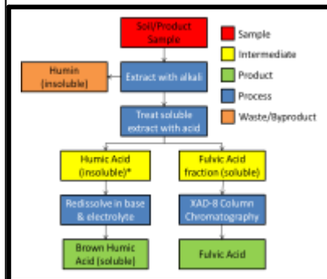
TWO STAGE PRECIPITATION
AND
SEDIMENTATION

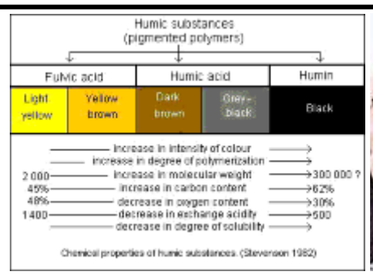
FILTRATION SEPERATOR



SPRAY DRIER

http://humatechina.en.alibaba.com/product/1150352967-212029476/SY3001_7_Fulvic_Acid_Powder.html





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