

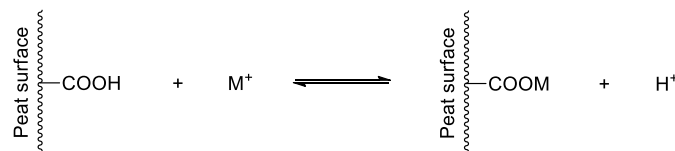
## APT's Metal Sorption Products: Under the Surface



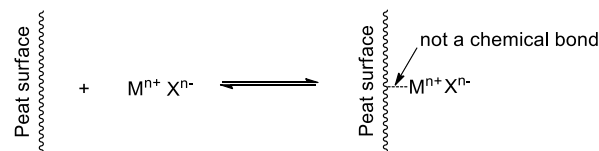
Reed-sedge peat is a complex material consisting mostly of lignin, hemicellulose, cellulose and humic substances. These constituents bear functional groups such as alcohols, aldehydes, ketones, carboxylic acids, phenolic hydroxides, esters and ethers that are primed and ready for chemical bonding. Further, the negative charge of these functional groups make peat a star performer against toxins with a positive charge, including the cationic form of many heavy metals.

With such an extensive list of functional groups, it's little wonder that the mechanisms of sorption for natural peat, APTsorb<sup>®</sup> and APTIVATOR<sup>™</sup> remain under debate. There are five commonly recognized mechanisms for the reaction of peat with metals:

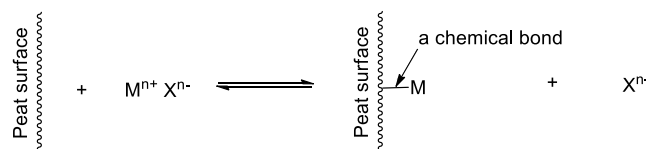
As the name implies, **ion-exchange** is simply an exchange of one ion, often a hydrogen ion on a carboxyl group, for another ion, such as a metal cation. This mechanism is often employed by traditional ion-exchange resins.



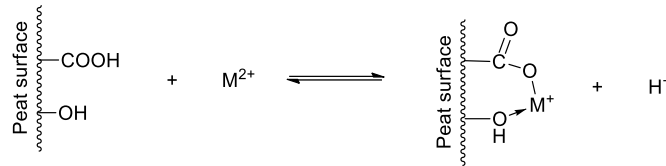
**Surface adsorption** is a weak, non-chemical attraction between the peat surface and a metal ion. This type of bond is easily reversed.



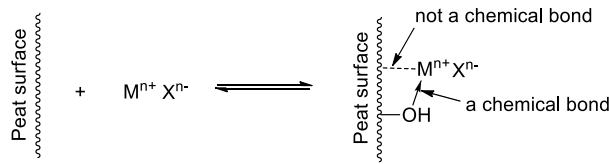
Chemisorption, or **chemical adsorption**, is a chemical bond between the surface of the peat and a metal cation. Unlike ion-exchange, there is no exchange of ions, but electrons may be shared or exchanged at the active site. Chemisorption results in a strong bond that is not easily broken.



**Complexation** is another type of chemical bond, but this time between two or more functional groups and a metal cation. The functional groups are often carboxyl and hydroxyl groups, and during the formation of the bond, the morphology of the media surface may change. A hydrogen ion may be released, depending on the functional group.



Lastly, **adsorption-complexation** is a hybrid type of mechanism, with a weak physical attraction forming between the peat surface and a metal-anion molecule while a functional group, such as a hydroxyl group, forms a chemical bond with the same molecule to balance out the charge.



### The APTsorb & APTIVATOR Advantage

Natural peat has too many shortcomings to be used as is. It is dusty and inconsistent. Also, raw peat does not have favorable hydraulic characteristics; water simply doesn't want to flow through it. Generally speaking, when raw peat is used as a water remediation media, large amounts of sand need to be added to the peat to maintain hydraulic conductivity in the bed.

APTsorb and APTIVATOR harness the attractive qualities of peat while overcoming the shortfalls. APTsorb looks like freeze-dried coffee and has a hydraulic conductivity of about 1 cm/sec. APTIVATOR is a spherical media – think poppy seeds or peppercorns – with a hydraulic conductivity of 2-14 cm/sec depending on particle size. Both products are robust media that can contend with variations in influent water. They do not require the addition of sand, which means that 100 percent of the treatment bed is dedicated to metals sequestration. The products are shipped fully hydrated and ready to put into your treatment vessel.



*Proven by nature...Engineered for performance.  
Unearth the power of peat.*