The outstanding features of the chernozem, which dominate all the other characteristics of this soil, are these: A high content of humus in the A horizon, an accumulation of carbonate salts in the B horizon, and a saturation of its colloidal complex by the metallic ions, among which the ions of calcium are by far the most significant. These characteristics show that the chernozem type of soil formation represents a mass effect of the three principal and interdependent pedogenic processes which can be designated as humification, carbonization, and calcification.

Humification, or humus formation, is precisely a biochemical process. A continuous flow of the original material from which humus is formed is furnished by living Nature in the form of organic residues. These consist of many different substances which can be classified in four general groups as follows:

1. Easily decomposing carbohydrates, such as celluloses, hemicelluloses and others
2. More resistant carbohydrates, particularly the lignins
3. Proteins
4. Fats, waxes, resins, etc.

The end products of a complete mineralization of organic residues as a whole are carbon dioxide, water, and simple mineral salts. A process of mineralization, or reduction of the fresh residues to the end products, proceeds rather slowly, and a number of various other substances are formed. Some of these are products of gradual decomposition of the original materials, some are synthesized anew, and a sum total of all these intermediate compounds usually is designated as humus.

Carbonization denotes the process of formation and deposition of the carbonate salts. It is assumed that carbon dioxide of these salts, whereas their cations are represented by different bases such as calcium, magnesium, and alkali earth metals. Among these bases, the alkali and alkali earth metals are by far the most important. The carbonates of these metals, however, do not accumulate in appreciable quantities because of their solubility. Therefore, a carbonization of chernozems means specifically an accumulation of the carbonates of magnesium, especially of calcium.

Calcification, or saturation of the soil colloidal complex predominantly by the ions of calcium and to less extent by the ions of magnesium, is the result of physicochemical reactions between colloids and the free bases in solution. Commonly, this reaction is considered as a physicochemical adsorption of the exchangeable bases by the colloids. The products of this process are certain complex salt-like combinations, in which the colloidal particles play the role of anions, and the cations of these bases are by nature represented by different bases such as calcium, magnesium, and alkali earth metals.