C-MASC Scholar Viewpoint

FROM THE DESK OF XIAODAN GAO

Long residence times of soil organic matter have been attributed to reactive mineral surface sites that adsorb organic species and cause inaccessibility due to physical isolation and chemical stabilization at the organic–mineral interface. Organic coating on the clay surface by adsorption of humic substances is essential for the structural stability of soil aggregates. It was generally found that cations enhanced colloidal aggregation, but the presence of natural organic matter can significantly inhibit the aggregation potential of colloids/nanoparticles.

My study explored the stabilization mechanism of minerals adsorbing organic matter in the mesoscale range of 1-1000 nm, from the perspective of the interaction force between minerals and organic matter. The results showed that the heteroaggregation process of soil humic acid and clay montmorillonite was sensitive to the small amounts of humic acid addition. Higher cation concentration and higher humic acid content were two necessary conditions for promoting humic acid and montmorillonite heteroaggregation. The carboxyl group C-O bonds and hydroxyl group O-H bonds of humic acid were two main adsorption sites by the formation of coordinate bonds with different metal ions. The results suggested that adjusting soil organic and inorganic interaction is a feasible approach to regulate particle aggregation and promote soil organic carbon stability.

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Sincerely,

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