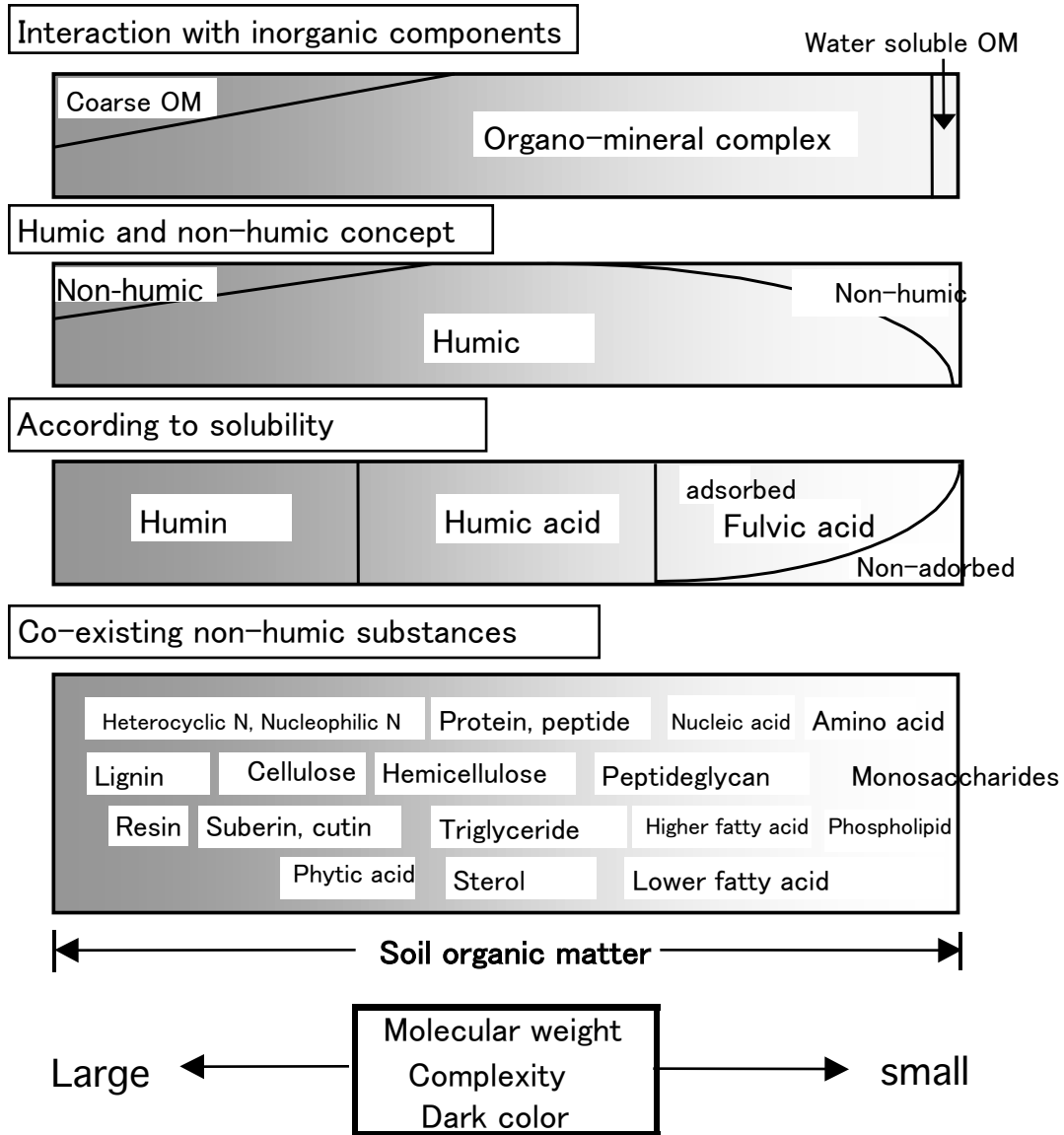


b

Proposed molecular structure of humic acid



Chemical composition of soil organic matter

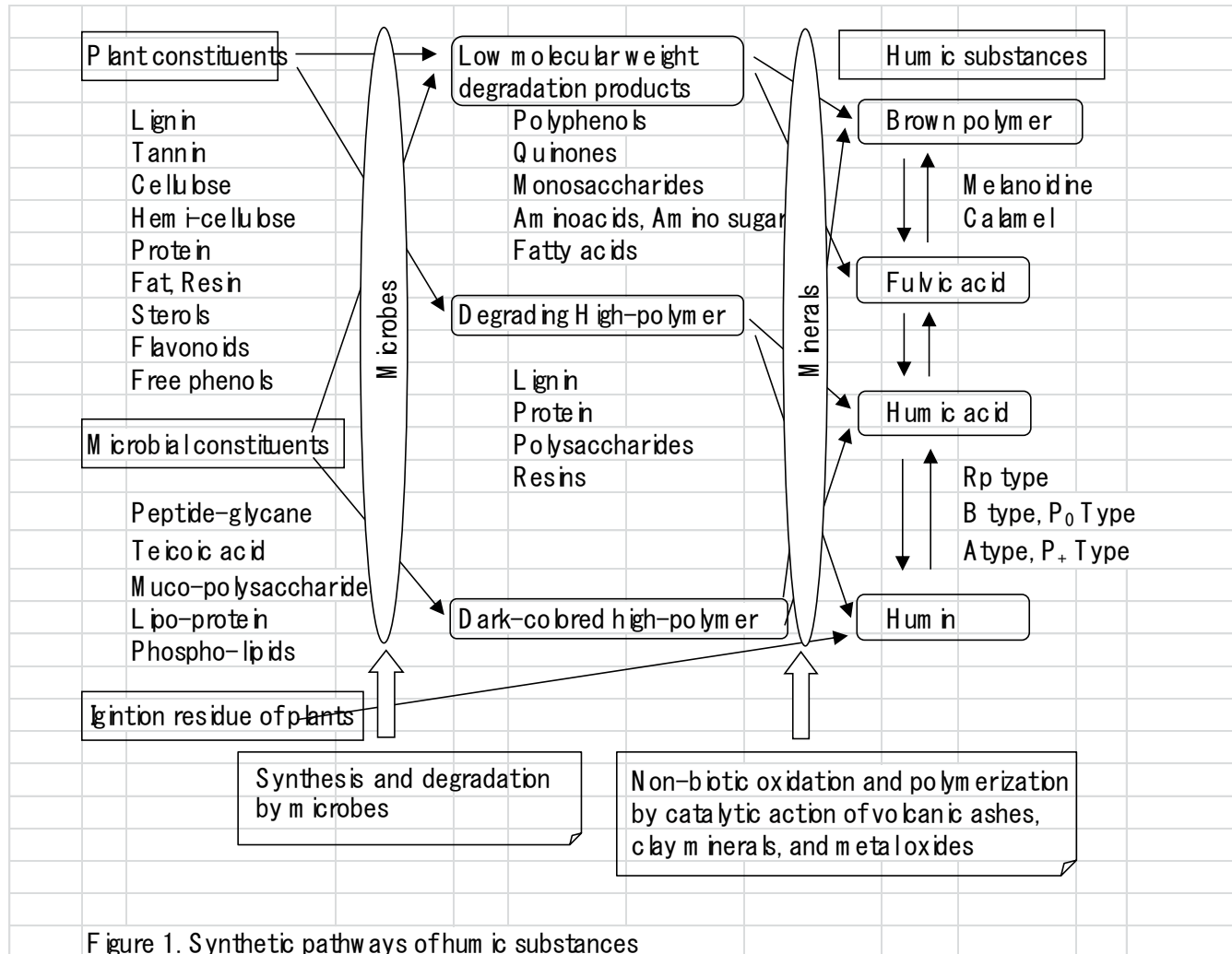
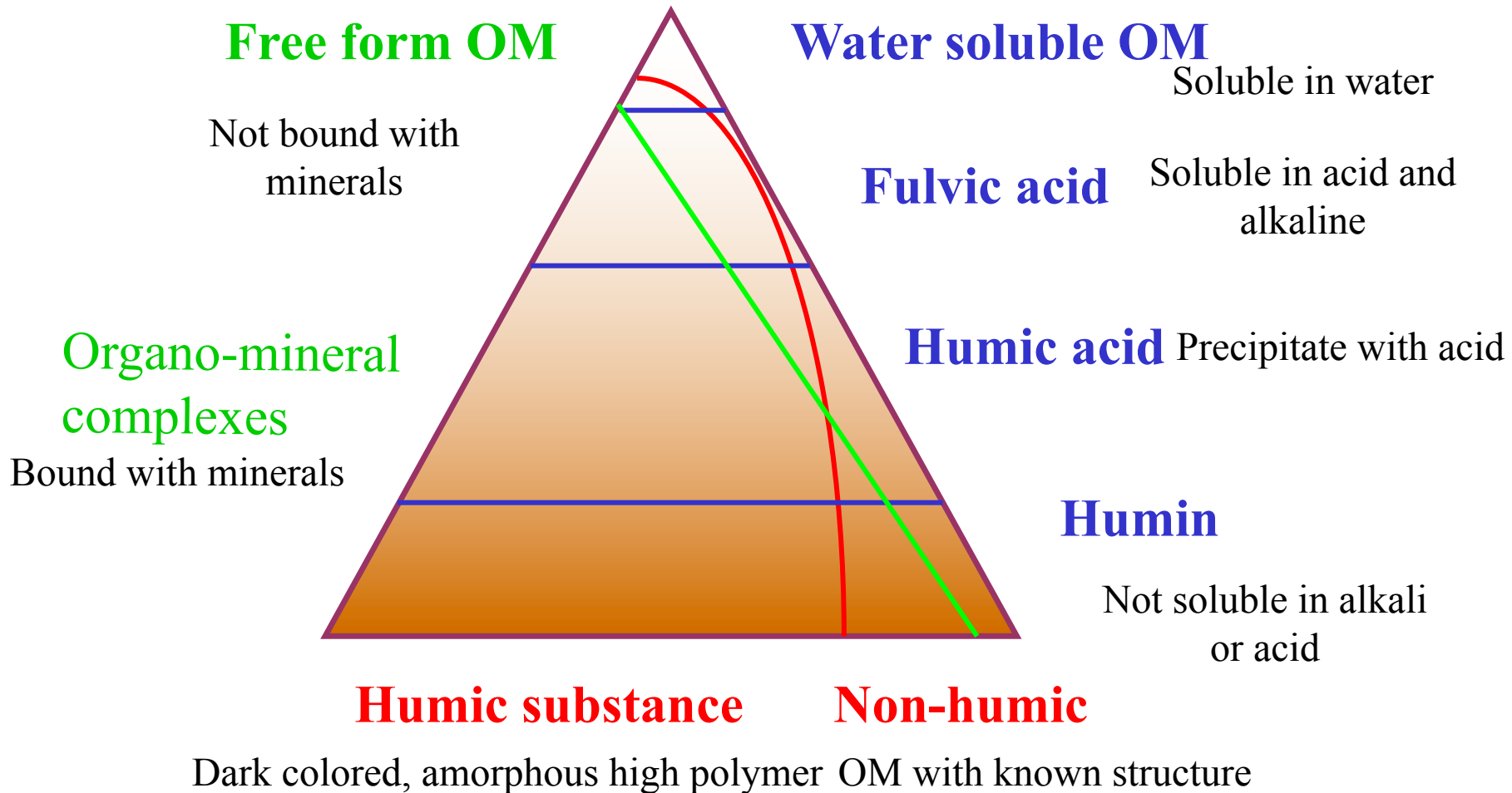
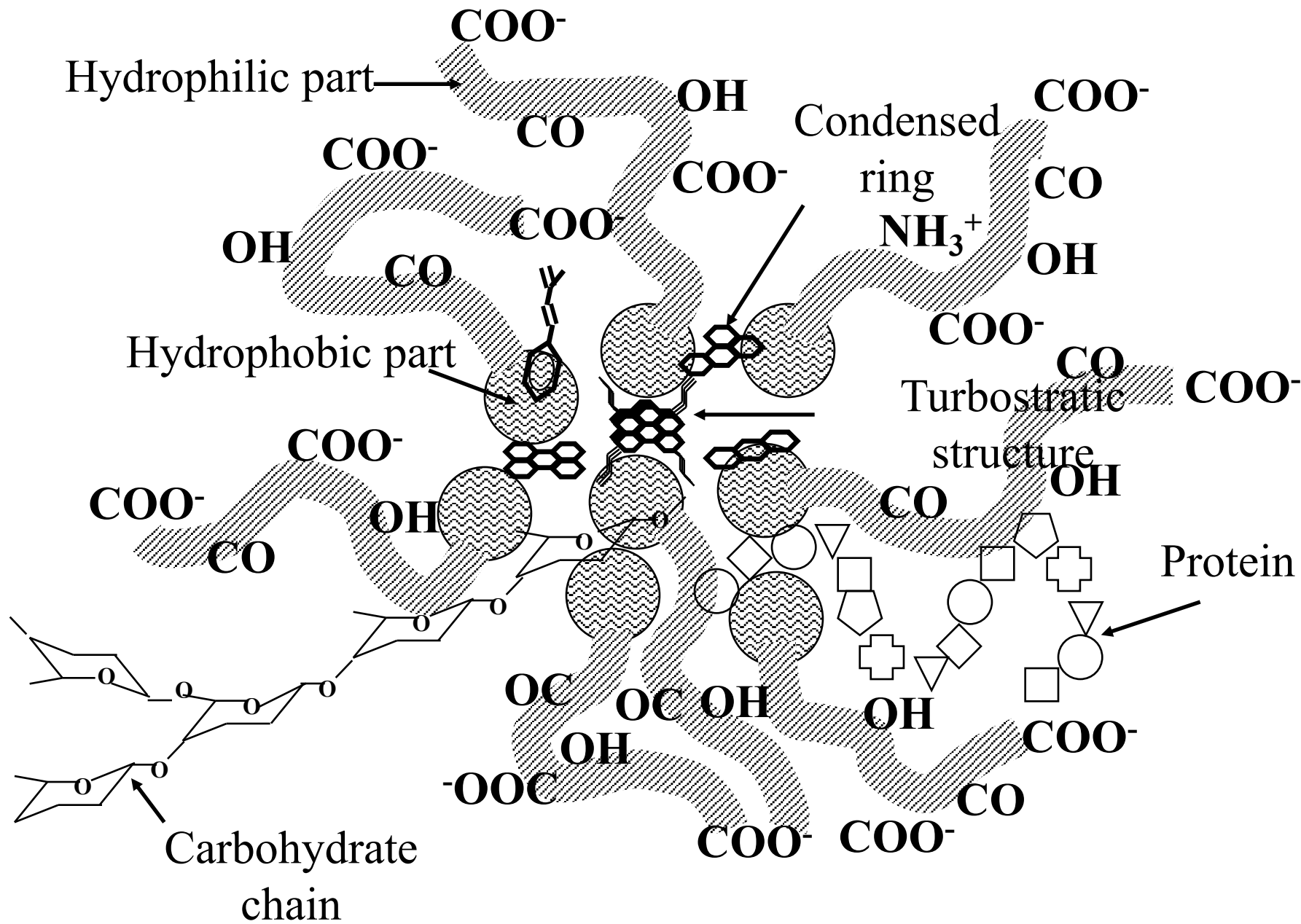


Figure 1. Synthetic pathways of humic substances



Concept on soil organic matter



Structural concept of humic substances

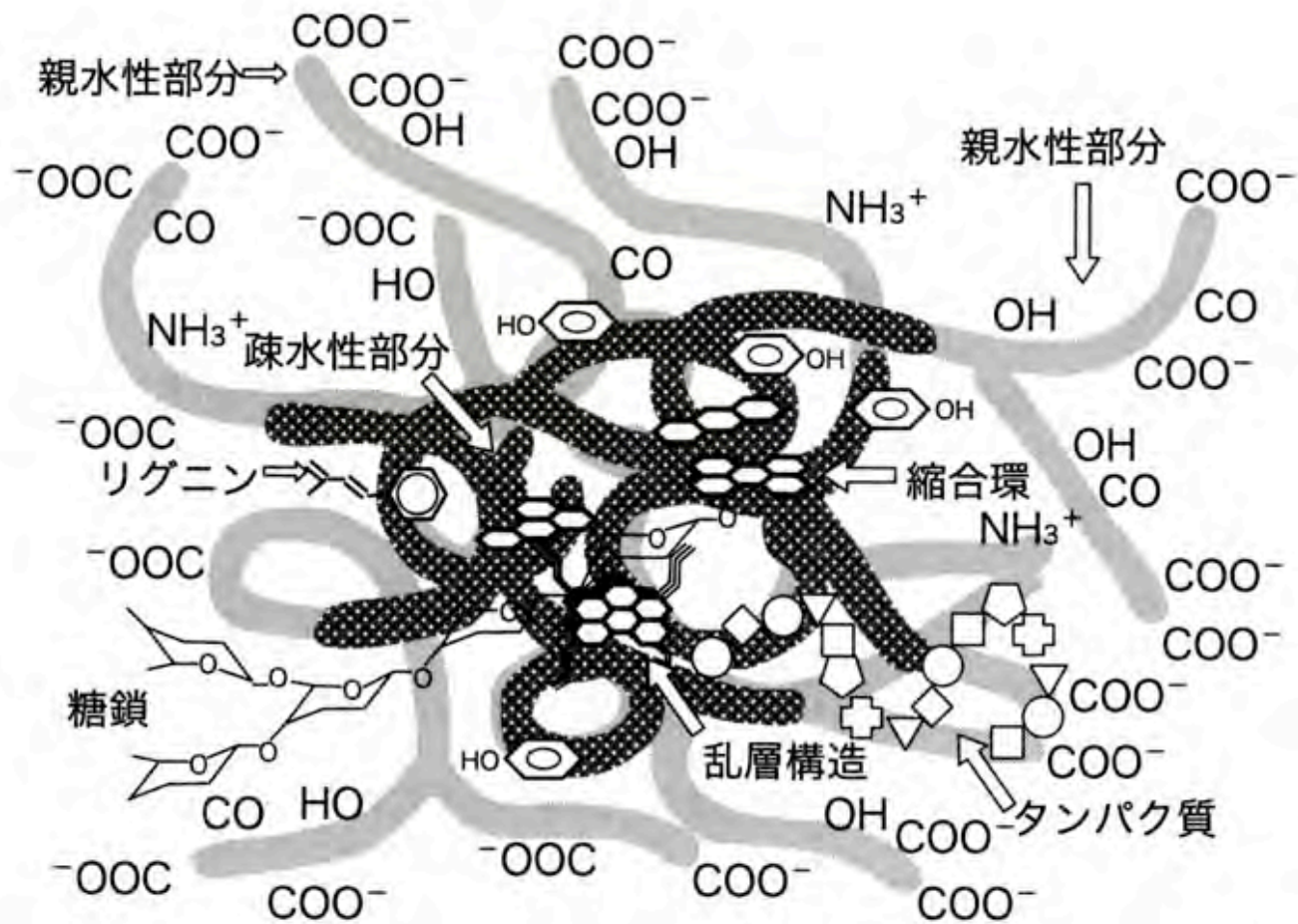


図7-15 腐植物質の構造概念図

Synthetic expression of elementary composition of humic substances

- As indices for expressing elementary composition synthetically, following ratios are calculated. Elementary number is used in the calculation.

Combustion Quotient

- Combustion quotient (CQ) is a theoretical value for respiration quotient as proposed by Tamiya ⁵⁾
- $CQ = \frac{4C}{4C + H - 3N - 2O}$ ----- (1)

Degree of Unsaturation

- Degree of unsaturation (DU) shows the number of unsaturated bonds and ring bonds per 100 carbon atoms.
- $DUH = (2C + N - H) / 2C \times 100$ ----- (2)

Degree of Oxidation (ω)

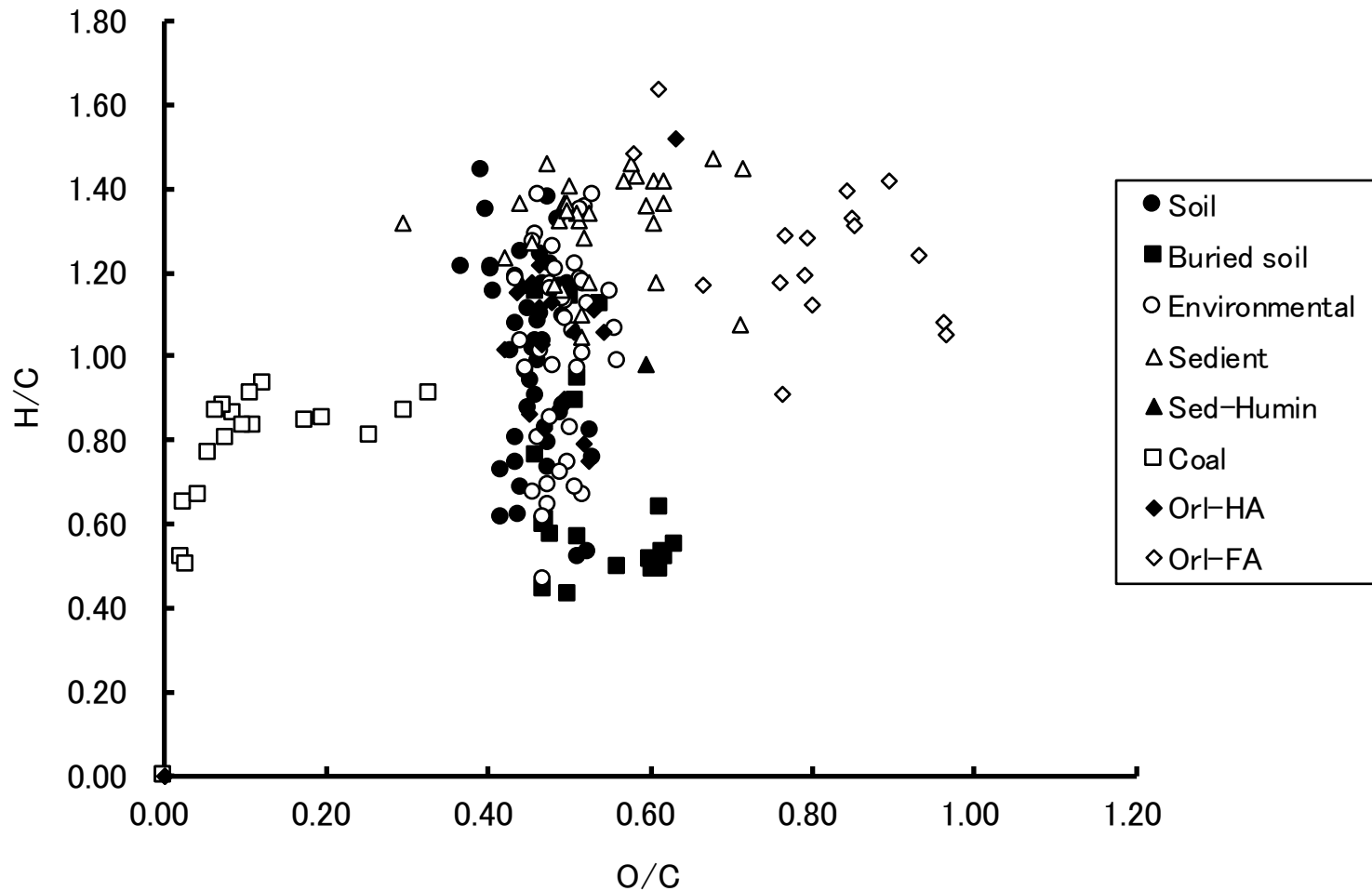
$$\omega = (2O - H) / C \quad \text{-----} \quad (3)$$

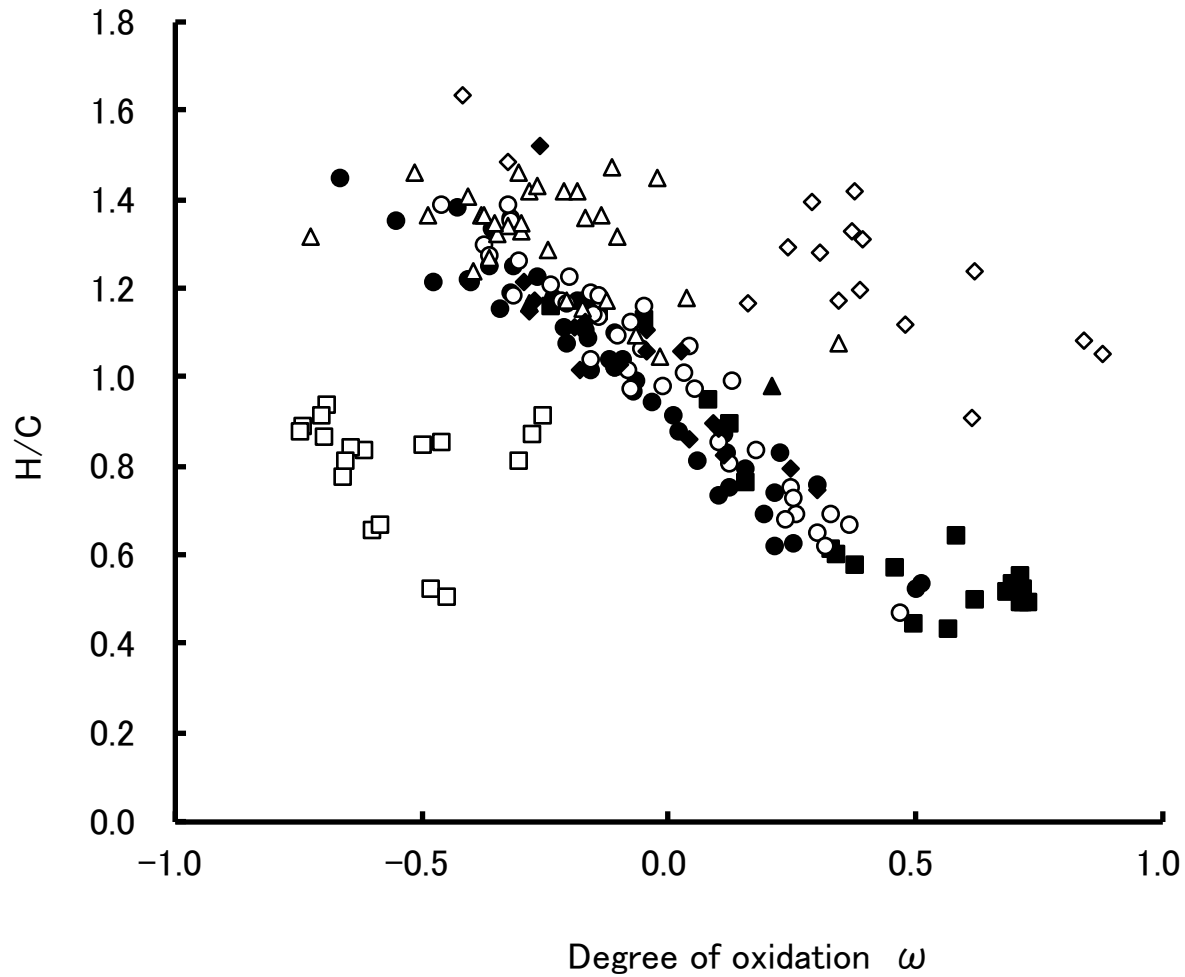
shows the excess or deficit of oxygen and hydrogen in comparison with $C_n(H_2O)_n$

- This value is distributed between -0.8 and $+0.9$ for humic substances.

Elementary composition of humic substances

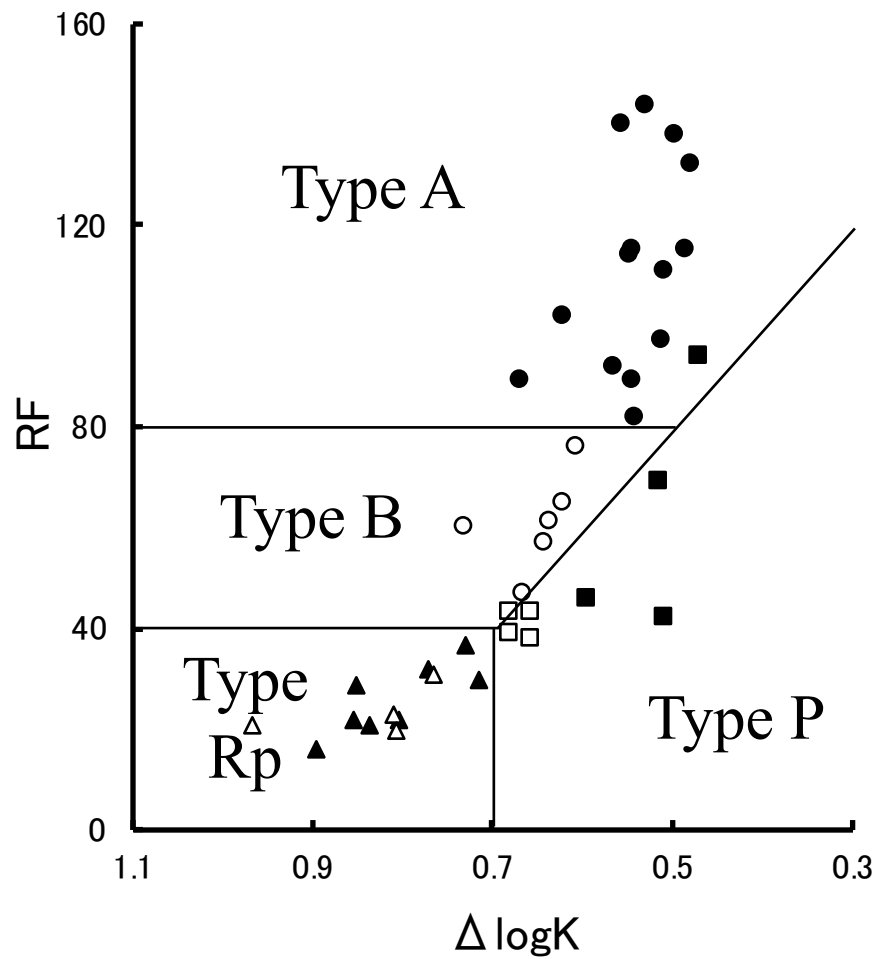
H/C and O/C





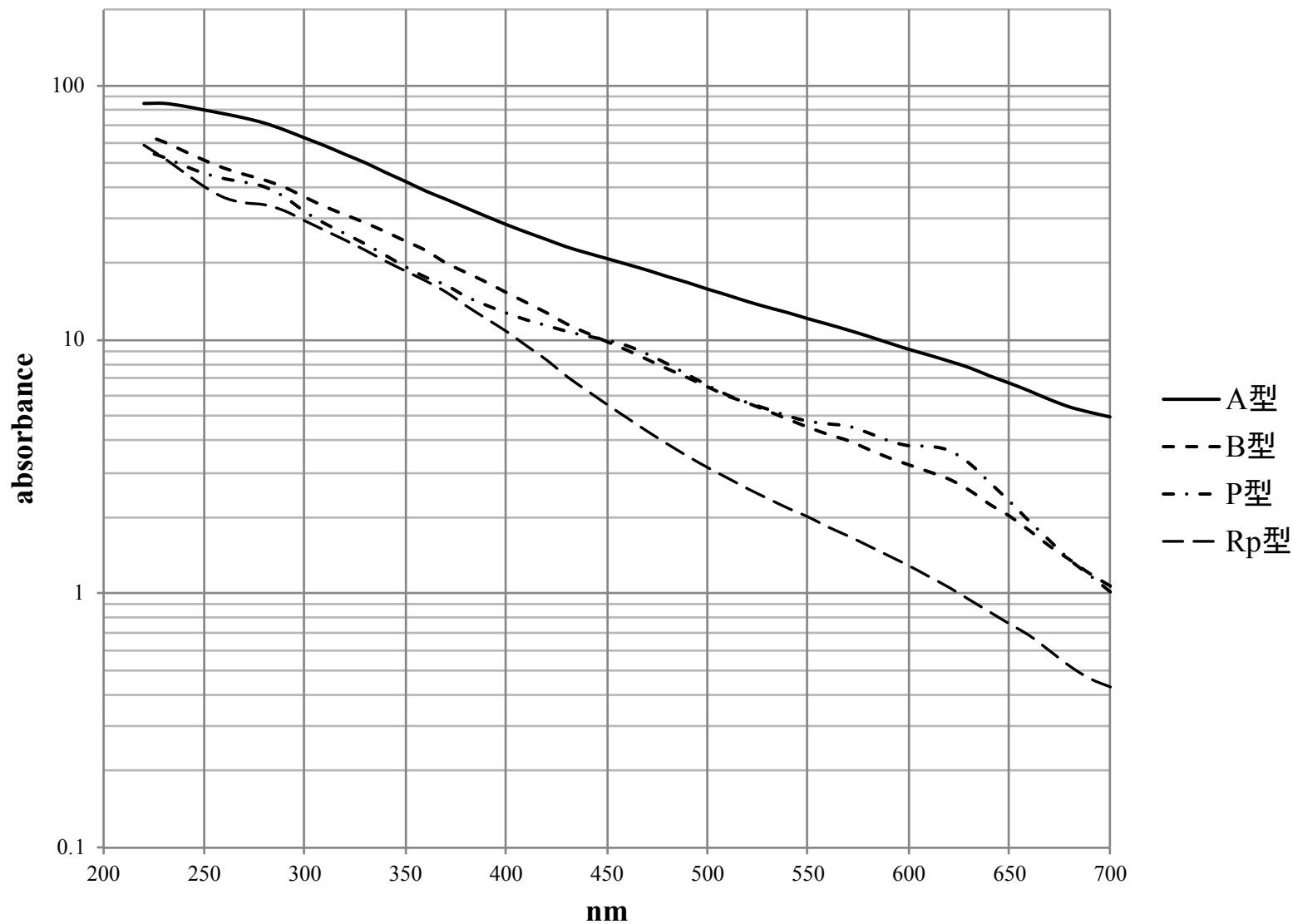
Degree of oxidation(ω) and H/C

- soil humic acids from literature 3
- humic acids from buried volcanic ash soils,
- humic acids from literature 7,
- △ humic acids from sea and lake sediments,
- ▲ humin from sediments,
- coal,
- ◆ humic acids from Russian soils in literature 6
- ◇ fulvic acids from Russian soils.

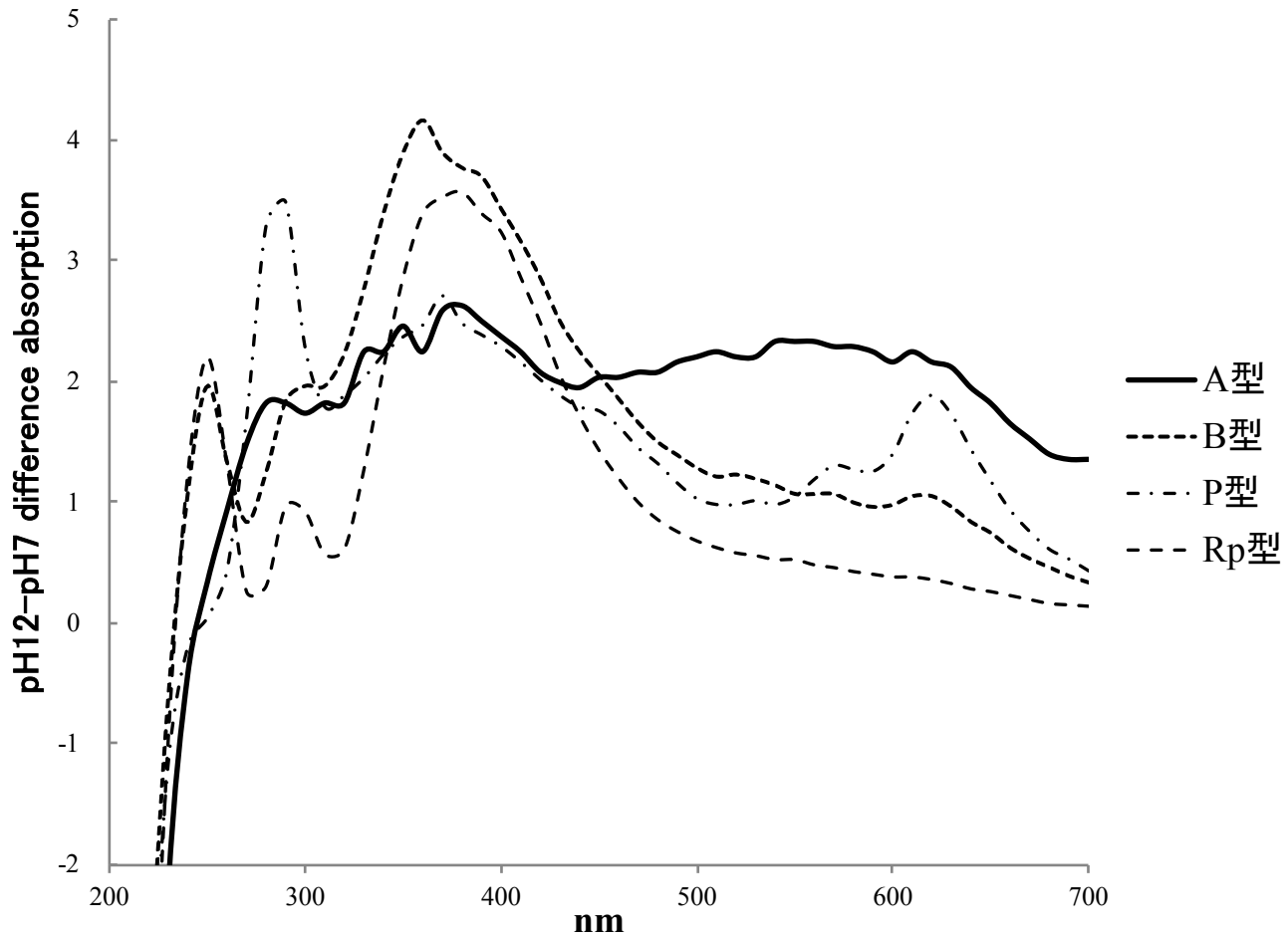


Classification of humic substances by RF and $\Delta \log K$

- Type A, ○ Type B, ■ Type P with obvious Pg absorption, □ Type P without Pg absorption
- ▲ Type Rp from mineral soil, △ Type Rp from O layer



UV-vis. Absorption spectra of humic acids in different types
 Type A Inogashira (volcanic ash soil), Type B Higashiyama (brown forest soil),
 Type P Tsubame (Pg of buried soil), Type Rp Anjo (paddy soil)
 Concentrations are adjusted to 1mgC mL^{-1}



pH12-pH7 difference absorption spectra of different types of humic acids.
(Same humic acids as in the previous figure)