**Lesson 4**

**Quantification based on SAR.**

The molar absorption coefficient is a measure of the sensitivity of photometric methods. The larger ε, the higher the sensitivity of the method, the lower the concentration of the substance can be determined.

Physical meaning of ε: at C = 1 mol/l and layer thickness l = 1 cm, ε = D. The molar absorption coefficient is equal to the optical density of a one-molar solution with a layer thickness of 1 cm.

Calculation of the molar absorption coefficient ε.

The calculation is based on the observance of the basic law of light absorption. The calculation is carried out according to the formula:

*D = ε* ·*l* · *C*

D is optical density;

ε is the molar absorption coefficient

l is the thickness of the absorbing layer (cm);

C is the molar concentration of the solution (mol/l);

The optical density of a solution of the same concentration is measured in cuvettes of different thicknesses and a plot of D versus l is plotted. The straightness of the graph indicates compliance with the Bouguer-Lambert law.

The interval of compliance with Beer's law is determined by the linear dependence of D on C. To do this, at a constant value of l, the optical densities of a series of solutions with different concentrations are measured.

To calculate ε, the optical density of a solution of known concentration is measured in a cuvette of a certain thickness. In photometric analysis, preference is given to methods with a larger value of ε.

Algebraic method (molar absorption coefficient method)

The method is used only if it is known that the solutions obey Beer's law (straight-line dependence of D on C). Then two solutions are prepared: the reference Ce and the tested Cx. For each of them, the expressions are valid:

*Dэ = ε*• *l* •*Cэ*, *Dх = ε*• *l* •*Cх*.

Since ε and l are the same, then

De/Dh = Сe/Сх, whence Сх= Dх•Се/De

If ε and l are known in advance, then Cx can be calculated immediately from the formula

Dx = ε l Cx, Cx= Dx / ε l