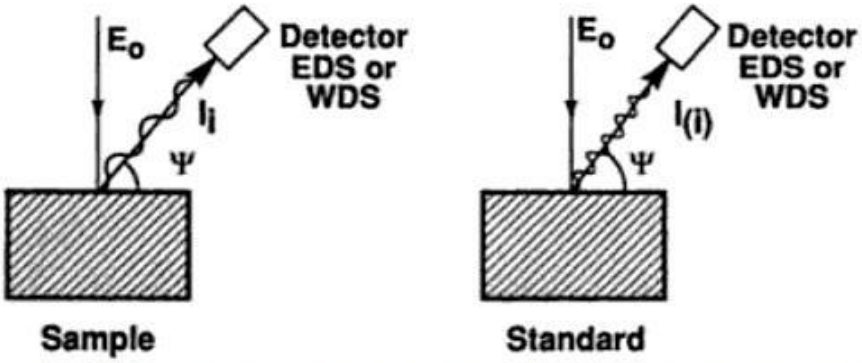
5. Quantitative characteristic X-ray microanalysis

Castaing (PhD work at Paris University 1951) developed a method for quantitative X-ray microanalysis for bulk samples, in which he calculated a given element concentration **Ci** in the specimen from the ratio of characteristic x-ray intensities emitted from the given element **i** and that (i) in the standard with the concentration **C(i).** If all measurements under the same experimental conditions, it is given by

$$C_i / C_{(i)} = I_i / I_{(i)} = k_i$$

As shown in the below experimental setup for measurement of the intensity ratio Ii/I (i) from the analyzed and standard samples.



NB1, the above relation was also called as Castaing's first approximation to quantitative analysis.
NB2, before the concentrations, both above characteristic x-ray intensities (counts) should deduct the background counts, which needs to use the different programmed modeling and filtering routines .

Even though the above relation seems extremely simple, in the real situations, the same experimental conditions for the analyzed and standard specimens could never be archived. Therefore the different specimen matrix effect must be corrected, in order to obtain 'true' concentrations. These corrections are divided as atomic number effect (Z), absorption effect (A), and fluorescence effect (F), commonly known as the ZAF technique, is given by,

$$C_i / C_{(i)} = [ZAF]_i \cdot I_i / I_{(i)} = [ZAF]_i \cdot k_i$$