What is the specular component from a diffusely reflecting sample and why is it important?

The specular component of light reflected from a sample is that portion which is reflected, mirror-like, at the angle of incidence. When this happens in diffuse reflection experiments, the specularly reflected light does not, typically, contain information about the chemical composition of the sample, but rather information related to the surface texture. Under almost all conditions, the analyst is not interested in such surface texture information (i.e., how shiny the material is) contained in the specular reflection. He is, however, very much interested in the identification of the material, the chemical bonds in the material, and/or how much of a given component is in a matrix of material. Because specular reflection (whether is occurs from a glossy sample surface or from a crystal surface) produces inverted "reststrahlen bands," it distorts the chemical bond information that the analyst is really looking for. Such bands are particularly strong for highly absorbing samples. The distortion of peaks caused by reststrahlen bands can cause misidentification in qualitative analysis and mistakes in quantitative analysis.

One technique for minimizing or eliminating reststrahlen bands is to grind and dilute the sample in a non-absorbing powder such as KBr, KCl, Ge, or Si. Grinding reduces the contribution of reflection from large particle faces. Diluting ensures deeper penetration of the incident beam, thus increasing the contribution to the spectrum of the transmission and internal reflection components. It is not always possible or practical to perform such sample preparations. Under such conditions, it is necessary to employ optical designs, such as those used with the Praying Mantis™ and Cricket™, to eliminate the specular component.