Although it is clear that osteoporosis is associated with a reduction in bone mass and a fragile skeleton, it is not understood whether the chemical composition of osteoporotic bone is different from normal bone. In this study, cynomolgus monkeys (*Macaca fascicularis*) were administered fluorochrome labels at one (calcein-label) and two (alizarin complexone-label) years after ovariectomy (Ovx) or Sham ovariectomy (Intact), that were taken up into newly remodeled bone. Using fluorescence-assisted synchrotron infrared microspectroscopy, the chemical composition of bone from Intact versus Ovx monkeys has been compared. Results from overall composition distributions (labeled + non-labeled bone) reveal similar carbonate / protein and phosphate / protein ratios, but increased acid phosphate content and different collagen structure in the Ovx animals. Analysis of the fluorochrome-labeled bone indicates similar degrees of mineralization in bone remodeled after one year, but decreased mineralization in Ovx bone remodeled two years after surgery. Thus, bone from monkeys with osteoporosis can be characterized as having abnormal collagen structure and reduced rates of mineralization. Coupled with factors such as trabecular architecture and bone shape and size, these ultrastructural factors may play a contributing role in the increased bone fragility in osteoporosis.