UNUSUAL TEMPERATURE EVOLUTION OF THE OPTICAL ABSORPTION SPECTRA OF YBaCuO HIGH-T_c . FILMS ABOVE AND BELOW T_c : EVIDENCE FOR A TEMPERATURE VARIATION OF THE HOLE CONCENTRATION

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It is shown that the optical transitions in this energy range are sensitive to the superconducting state, to temperature and to doping effects. The absorption spectra of the superconducting films give conclusive evidence for the existence of an optical pseudogap with charge transfer for $E \cong 2.0$ eV. For $0.1 < \delta < 0.35$ the spectra become more transparent at low temperature in the whole measured spectral range. The following anomalies of the temperature dependence of the absorption are observed: i) linearly decreasing absorption with temperature above T_c ; ii) turning point in the vicinity of T_c ; iii) freezing spectra for $T < T_c$, i.e. the absorption is independent of temperature. Since we observe a sharp absorption anomaly near T_c , the unusual temperature dependent part of the absorption should be connected with the narrow oxygen band and states near the Fermi level E_f (as initial of final states for optical transitions). So the temperature evolution of the absorption reflects changes in the N_h oxygen band population and the position of the Fermi level. The shift of E_f with temperature must occur due to the CuO_2 plane to CuO chain charge transfer, which maintains the equilibrium between the quasi-independent electron subsystems in the process of thermal expansion. The discontinuity of $N_h(T)$ near T_c is related to the arising superconducting gap Δ . It is possible to conclude that the occurrence of superconductivity may be connected with the degeneracy of the Fermi level at $T > T_c$, which produces a lattice instability especially involving the O(4) apex oxygen.