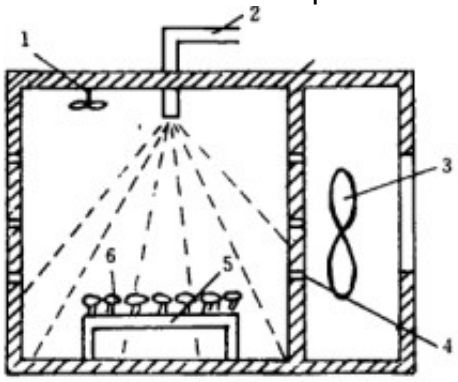
Theory of microwave drying

The resistivity of about 13-10119.cm is an excellent insulator or dielectric; air-dried wood (resistivity is 101-1099 cm) is between conductor and semiconductor; wood with moisture content above fiber saturation point (resistivity is about 10 degrees acm) is a semiconductor. It is also pointed out from the study of the effect of temperature on wood resistivity that water resistivity decreases with the increase of temperature, which is a remarkable feature of semiconductors. Therefore, dielectric loss heat effect and eddy current heat effect will appear in microwave drying equipment.

Because of the high resistivity of wood and the inverse ratio of eddy current calorific value to electrical resistance, the calorific value is much smaller than the loss of medium, so it can be omitted. The mechanism and mechanism of microwave drying of wood are similar to that of high frequency drying. However, the dielectric properties of wood are very complex, and there are many influencing factors, which are not only related to electric field frequency and temperature, but also closely related to the anisotropic structure, chemical composition and moisture content



of wood itself.

Generally speaking, there are four kinds of polarization phenomena in wood: the electron displacement polarization molecule, atom or ion's electron shell displacement relative to the nucleus along the direction of the external electric field; the ion displacement polarization molecule in the ion displacement polarization molecule along the direction of the external electric field relative to other ions displacement dipole polarization polarization polarization polarization polarization molecule electric dipole moment to the direction of the external electric field orientation The time required for the four polarizations to be established is different. The pool polarization takes the shortest time, about 10-14 seconds, 10-12 seconds for the ion displacement polarization, and 10-12 seconds for the electron polarization direction. It takes several seconds, tens of seconds or longer to establish the electromagnetic frequency infrared ultraviolet time when the polarization is greater than 10. Fig. 1 The effect of different polarization mechanisms on the dielectric coefficient in microwave field. The wood polarization will change with time to the electron displacement polarization and the ion displacement polarization establish rapidly, without hysteresis, so there is no thermal effect.

Orientation polarization is not the case, because it takes longer to establish than the microwave cycle, that is, lagging behind the changes in the microwave field, there will be a thermal effect.

Water molecule in wood is a polar molecule with fixed electric dipole moments. It oscillates or oscillates in the alternating orientation of microwave field, interacts with the surrounding molecule and produces thermal effect just like friction, which is the main aspect of wood medium loss. As for the interfacial polarization, which takes much longer to establish than the microwave period, the polarization phenomena are very insignificant. Thermal effect 3 Wood polarizability tensor and dielectric tensor do not appear. Wood is a kind of anisotropic dielectric, and their dielectric properties should be characterized by polarizability tensor and dielectric tensor. The situation of dielectric in alternating electric field 5. For isotropic dielectric E, polarization P and electric displacement D in the same direction, this paper uses the complex form and scalar symbols, such as E, D and P.