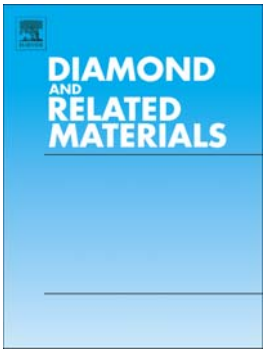


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# An investigation on dielectric properties of diamond films in the range of K and Ka band

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**Abstract:** Low dielectric loss, high quality diamond films could be exploited as a promising dielectric material. On the other hand, dielectric properties of diamond films are markedly affected by deposition conditions. In this investigation, dielectric properties of diamond films were measured by using the split-cylinder resonator method at two frequencies (~24 and 30 GHz) in K and Ka band, and the influence of deposition parameters including substrate temperature, methane and nitrogen concentrations on dielectric properties of diamond films were investigated. Experimental results showed that while deposition conditions have little influence on dielectric permittivity, they have a vital influence on dielectric loss tangent value of the diamond films. In addition, results showed that diamond films with different qualities exhibited different frequency dependences in their dielectric loss property. By comparing dielectric loss tangent values measured at the two frequencies and characteristic Raman peak width of the diamond films, it is suggested that diamond films with large Raman peak width have high degree of lattice disorder, which will result in an increase in dielectric loss of the material, due to one-phonon excitation of acoustic vibrations or Rayleigh scatterings to microwaves.

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