High-pressure High-temperature liquid carbon dioxide

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Carbon dioxide is a simple system widely studied because of its importance in life and geological sciences. Despite its simplicity, it shows several high-pressure polymorphs quenchable at room temperature and its phase diagram isn't still fully characterized especially at high temperature [1,2,3,4]. This work deals more specifically with the properties of liquid carbon dioxide at high pressure and high temperature. We have measured the melting curve separating the liquid from phase I (the dry-ice cubic structure) from 300 to 800 K by visually monitoring the solid/fluid equilibrium inside a diamond anvil cell and identifying the solid phase by Raman scattering. Our data are in good agreement with those from Bridgman to 366 K[5] but deviate from the work of Grace and Kennedy [6] for temperatures greater than 370 K. The only recently measured melting point by lota and Yoo [1] is in fact well inside the liquid domain. We also redetermined the I-IV transition line and found it guite different from the one of Ref. [1], whereas consistent with the melting curve data. Brillouin scattering and refractive index measurements have been performed on the hightemperature liquid in order to obtain the sound velocity along several isotherms and then to calculate the equation of state of liquid CO₂ to 8 GPa and 700 K.

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