

Sapphire, Al ₂ O ₃	≤5.5	1.73 at 2.2	50.56 × 10 ⁶	1370 1525–2000	9.8 × 10 ⁻⁵
Diamond *	c				
Type I	2–4, 5.5–7, 10–16	2.4173		7000	Insoluble
Type II	0.26–4; 5.5 through FIR				
Ceramic barium titanate, BaTiO ₃	≤6.9	2.4 at 2.2, 4.3	16.50 × 10 ⁶		
Calcite, CaCO ₃	0.2–5.5	≈ 1.7			
Germanium	1.8–2.3	≈ 4.0			
Silicon	1–9	3.43 3.42			
Fused silica SiO ₂ (Corning 7905, GE type 101-100, Infrasil)	0.3–3.5	1.43			
NBS F158 SiO ₂	4.5	1.80			
Bausch & Lomb ^d					
RIR-2	4.5	1.75			
RIR-10, 11, 12	5.0	1.62			
RIR-20	5.5	1.82			

* Diamond has the highest Debye temperature and type II diamonds demonstrate higher thermal conductivity than type I diamonds (see C.Y. Ho, R.W. Powell and P.E. Lilly, J. Phys. Chem. Ref. Data, Supp. 1, 3 (1974) L-118. ^a Taken in part from ref. 72. ^b 298 K. ^c UV and visible absorption and FIR depend upon particular type of diamonds used here. ^d Calcium aluminate (CaO–Al₂O₃) and similar materials. ^e Note that UV limitations exist for all of these materials in addition to those of diamonds.

with both diamonds. An improved method for coupling the DAC optically with a Raman spectrometer has been discussed by Adams et al. [74]. The fluorescence problem of diamonds under laser excitation and its effects on the Raman measurements in a DAC are discussed by Adams and co-workers [53,72,75].

The first high pressure Raman study with a piston-cylinder cell was made by Gonikberg and co-workers [76]. A Raman study using a piston-cylinder cell (Daniel type) which gives hydrostatic pressure has been made [77-79]. Figure 7 illustrates this cell. Walrafen used a back-scattering Raman cell equipped with windows made of single crystals of sapphire [80]. Nicol et al. [46] and Ferraro [45] have used the Drickamer cell for Raman studies.

Table 6 summarizes the various pressure cells used for Raman spectroscopy at high pressures.

(iv) Optical windows for use at high pressures

For the anvil-type high pressure cells the window material serves the dual purpose of transmitting the pressure and being transparent to the electromagnetic radiation of interest. In the Drickamer piston-cylinder cell this is also true in part, although the mechanism of pressure transmission is not done by the window. Table 7 lists a number of possible windows for use at high

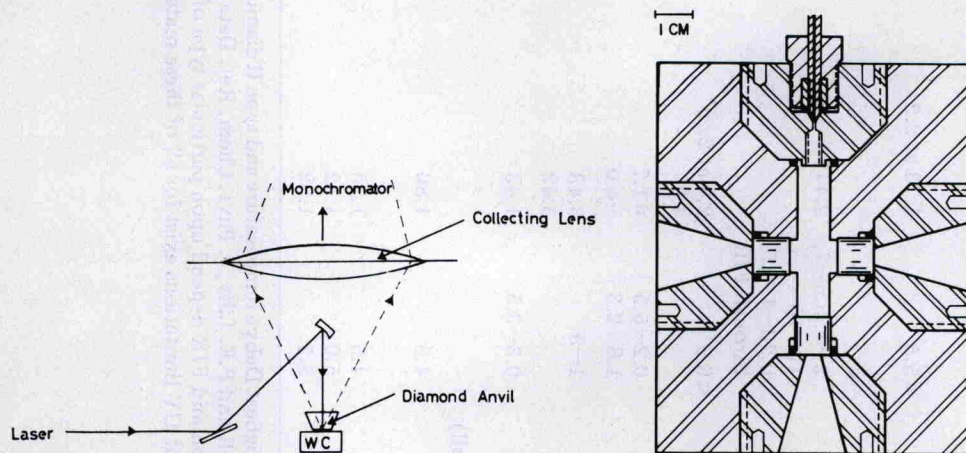


Fig. 6. Details of DAC with one tungsten carbide anvil [53]. (Figure reproduced through the courtesy of the authors and Applied Spectroscopy.)

Fig. 7. Daniels-type Raman cell [77-79]. High pressure optical cell with three oriented single crystal synthetic sapphire windows. The *C* axes of the sapphire windows are oriented normal to the flat window faces. (Figure reproduced through the courtesy of the authors and Review of Scientific Instruments.)