Sapphire, Al_2O_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 ($CaO—Al_2O_3$) 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

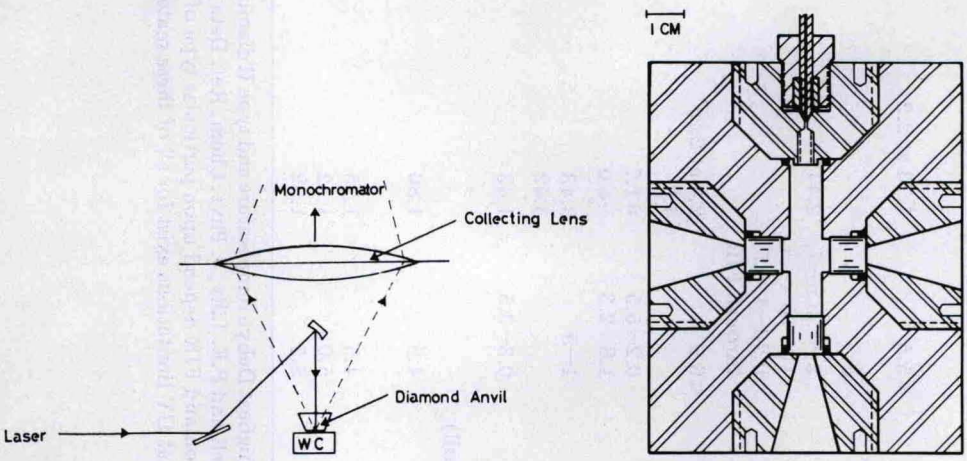

Fig. 6. Details of DAC with one tungsten carbide anvil [53]. (Figure reproduced through the courtesy of the authors and Applied Spectroscopy.)

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.)