β-alumina has been shown to decompose by a two-step process. The final temperature of structural breakdown is much higher than is usually found for other compounds containing hydrogen.

Acknowledgements

We should like to thank Dr G. J. May, Chloride Silent Power Ltd., and Mr R. J. Bones, AERE Harwell for provision of the β-alumina used in this work, Professor R. J. Brook and Dr A. E. Hughes for valuable discussions, and Mr K. T. Harrison for taking some of the X-ray powder diffraction patterns. Mr D. Gilling also helped collect the experimental data.

References

1. J. T. KUMMER, *Progr. Solid State Chem.* 7 (1972) 141.
2. VON H. SAALFELD, H. MATTIES and S. K. DATTA *Berichte der Deut Keram Gesellschaft* **45** (1968) 212.
3. McGEEHIN and A. HOOPER, *J. Mater. Sci.* **12** (1977) 1.
4. J. S. LUNDSGAARD, and R. J. BROOK, *ibid* 8 (1973) 1519.
5. *Idem, ibid* **9** (1974) 2061.
6. J. JENSEN and P. McGEEHIN., Proc. Materials and Energy Conference, Brussels (1977).
7. J. E. STILL and H. J. CLULEY, *The Analyst* 97 (1972) 1.
8. J. S. LUNDSGAARD and H. DEGN., *IEE Trans. Biomed. Eng. BME* **20** (1973) 384.
9. T. NISHIKAWA, T. NISHIDA, Y. KATSUYAMA, Y. KAWAKITA and I. UEI, *Nippon Kagaku Kaishi* **6** (1974) 1048.
10. R. P. TISCHER, private communication

Received 22 June
and accepted 25 July 1977.

J. JENSEN
University of Odense, Department of Chemistry, 5000 Odense, Denmark
P. McGEEHIN
Materials Development Division, AERE, Harwell, Didcot, Oxon, UK

Estimation of quartz in silica bricks by infrared spectra

The need to know α-quartz content in a fired silica brick (principally consisting of tridymite and cristobalite) used as a refractory material, arises because the expansion and contraction phenomena associated with this phase during transformation leads to cracking and spalling of the bricks while in use. Difficulties have been experienced in detecting unambiguously α-quartz present in low percentages by X-ray diffraction because of the overlapping of the tridymite XRD line with that of the most intense line of α-quartz at 3.34 Å.

The infrared spectral method has been found useful below 900 cm^{-1} as a complimentary method to estimate the quartz concentration in silica bricks. This is possible because of the characteristic peaks of the phases in this region. α-quartz has a sharp band at 690 cm^{-1} while cristobalite has a similar band at 620 cm^{-1}. Tridymite has no such band however. The other bands of these phases are overlapping (Fig. 1, Table I).

A routine potassium bromide pellet technique using the standard setting of the i.r. instrument (Perkin Elmer 621) was adopted as reported earlier in connection with an estimation of dolomite mineral [1]. The only difference in the sampling technique was to increase the amount of the sample in the KBr pellet (about 5 to 6 mg in 250 mg of KBr) so that an appreciable intensity of the 690 cm^{-1} band was obtained. The presence of quartz as low as 2% in the sample can thus be detected in the brick. The intensity of the 690 cm^{-1} quartz band varies in the spectra of brick samples, with 12% quartz (brick No. 1),

TABLE I Infrared data of silica polymorphs in the 900 to 400 cm^{-1} region

α-quartz	Tridymite	Cristobalite	Brick sample No. 1	Brick sample No. 5
790 sh				
	780	785	787 s	786
775				
			691 w	
690 sharp				
		620 sharp	620	620
510 sh, br				
		470 s, br	470	473
460 br	460 s, br			

br = broad, s = strong, sh = shoulder, w = weak

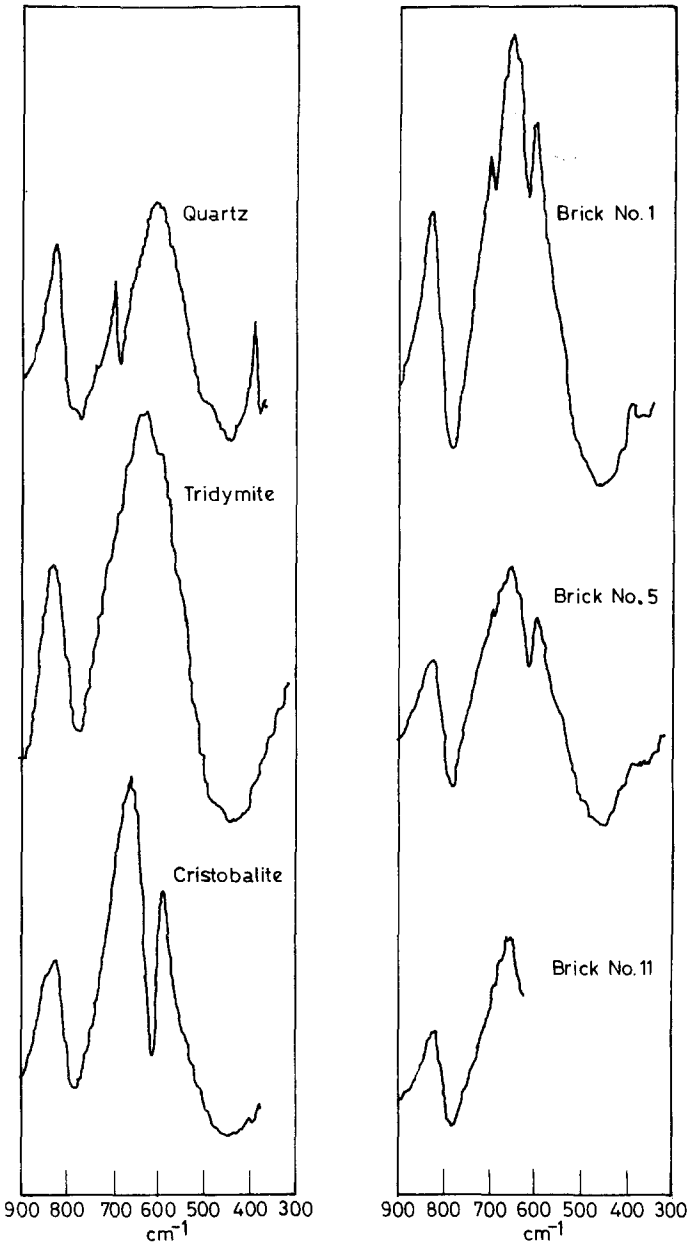

Figure 1 Infrared spectra of silica polymorphs and fired brick samples.

5% quartz (brick No. 5) and 1% quartz (brick No. 11) as shown in Fig. 1.

References

1. S. N. GHOSH, V. N. VISVANATHAN and A. K. CHATTERJEE, *J. Mater. Sci* **11** (1976) 1167.

S. J. RAINA
S. N. GHOSH
V. N. VISVANATHAN
Cement Research Institute of India
Ballabgarh, Haryana, INDIA