

Powder XRD studies of gallstones

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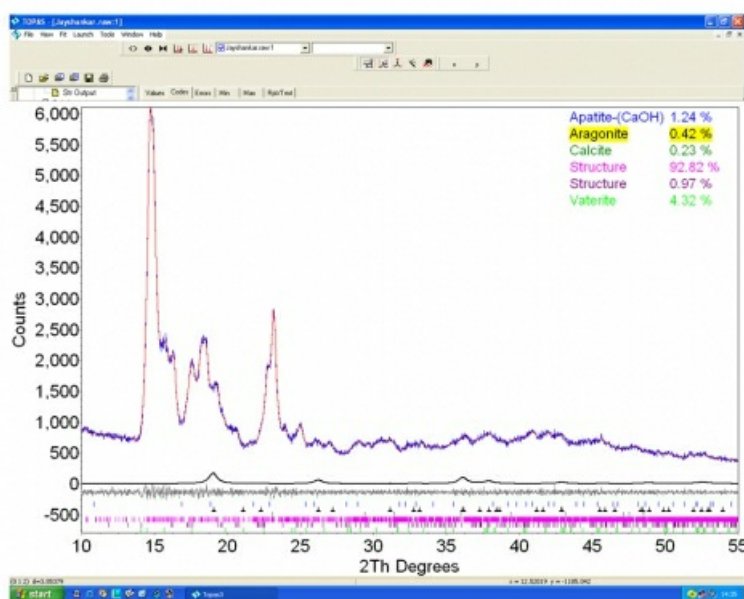
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We have studied four gallstones, three yellow to yellowish white and one black in color, collected from Konnagar locality of West Bengal, India, using CuK $\alpha$ 1 radiation as a probe. As a matter of fact we tried to analyze quantitatively these stones using Bish and Howard [1] formalism but were successful only in one case of a yellow stone. In other three samples such crystalline materials (e.g. calcium palmitate) are present, which have no Crystallographic Information Files (CIF) and could not be incorporated into quantitative phase analysis process based on Rietveld refinement. However, their qualitative compositions have been successfully obtained using powder XRD and FTIR data. Outcome of quantitative analysis (using Topas program, supplied by Bruker) of one of the yellow stones shows that it contains cholesterol mono hydrate (92.82%), vaterite (4.32%), apatite (1.24%), alpha- palmitic acid (0.97%), aragonite (0.42%) and calcite(0.23%), with residual Rwp=3.433. Apart from compounds mentioned above, we have detected different forms of cholesterol, calcium palmitate, bilirubin, and some amorphous materials in three other stones, which could not be analyzed quantitatively. Asymmetry in a few peaks due to vaterite and aragonite strongly suggests presence of twinning fault. Crystallite sizes measured using Sherrer formula clearly depicts none of the materials mentioned above are nano-sized. Our results corroborate a similar study of gallstones [2] collected from Indian sub-continent using wet analytical techniques. This is possibly a unique case where total quantitative analysis of a gallstone has been achieved using powder XRD data.

1. Bish, B.L.& Howard, S.A. (1988) J. Appl.Cryst. 21, 86-89

2. Sutor, D.J. & Wooley, S.E. (1971) Gut. 12, 55-64



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