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**PREPARATION OF A DIFFUSION MATERIAL FOR  
COLOURATION OF COLOURLESS TOPAZ**

A PROJECT REPORT PRESENTED BY

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## PREPARATION OF A DIFFUSION MATERIAL FOR COLOURATION OF COLOURLESS TOPAZ

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### ABSTRACT

Topaz is often colourless and also occurs in various shades. Colourless topaz is cut and polished and subjected to diverse physical and chemical treatments to induce colour. Widely used colour inducing method for topaz is irradiation, followed by heating. However, there are inadequate facilities to carryout the irradiation treatments in Sri Lanka. Chemical diffusion is another way of inducing colour in topaz. This is a low cost method, and has some advantages, and therefore, it is important to find a suitable material for chemical diffusion in topaz. Because colourless topaz is plentiful in Sri Lanka and there is a very high demand for coloured topaz in international market, one is tempted to induce colour in topaz.

A number of topaz diffusion materials were prepared making use carbon powder as a base material. To find the most suitable carbon powder for the base material three different sources i.e. activated carbon powder, coconut charcoal powder and carbon powder collected from a kerosene oil lamp (bucky balls) were used. Thereafter, various amounts of oxides and carbonates of transition metal elements such as  $\text{Fe}_2\text{O}_3$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{CoCO}_3$ ,  $\text{MnCO}_3$ , and  $\text{NiCO}_3$  etc., were added to the base material. To some mixes of base material + oxide/carbonate, borax or 1:1 mixture of  $\text{Na}_2\text{CO}_3$  and  $\text{CaCO}_3$  was added to reduce the melting point of the mixes. These mixes used as diffusion materials were coated on cut and polished topaz stones and heat-treated in the temperature range of  $900^\circ\text{C}$  –  $950^\circ\text{C}$  in an electric furnace. Routine gemmological examinations of the topaz stones were carried out for each specimen before and after the treatment. The colour inducing was studied using UV-Visible spectroscopy.

Only cobalt-bearing mixes materials induced colours in topaz and resultant colours ranged from blue, greenish-blue and bright green. The resultant colours were

dependent on the concentration of Co in the mix, maximum temperature of heating and soaking period and on the particle size of the base material. Colour diffusion occurred only to a depth of a few microns beneath the surface of topaz stones. The use of this low-cost method of diffusion would produce permanent colours in topaz and it will definitely create a considerable economic advantage.