INTRODUCTION

There have been numerous studies completed on the physical properties of dental amalgam. However, most of these investigations have observed the responses of amalgam to certain physical tests; less effort has been made to explain what is responsible for the observed behavior and how physical properties are related to the structure and composition of dental amalgam. In a previous paper,[1] the authors have described the experimental techniques used and the measurements made of the elastic constants of dental amalgams as a function of pressure in the range 0-50 kilobars. In order to develop a model which explains the elastic properties observed, it was necessary to examine the elastic constants of the constituent phases of amalgam as well. This paper presents the results of that investigation of the elastic constants of γ-Ag_3Sn, γ_1-Ag_2Hg_3 and γ_2-$HgSn_{7-8}$. In the final paper of this series,[2] the authors develop a model of the elastic constants of amalgam based on its composition and structure and on the elastic constants of the constituent alloys.

MATERIALS

50 gram Ag_3Sn samples (74.5 atomic % Ag, 25.5 atomic % Sn) were prepared by melting silver and tin shot under vacuum in vycore tubes; 99.999% pure elements were used. The molten alloys were shaken and slowly cooled to homogenize the samples. The specimens, cut in the form of one cm. diameter, two mm. long cylinders, were cold worked and annealed at 450°C for 24 hours. X-ray diffraction patterns verified that the specimens were single phase γ-Ag_3Sn; metallographic examination after polishing and etching showed that the crystallite size was small.