

### PLAN OF THE WORK

The present work is probably the first of its kind to investigate the possibility for preparing disc shaped single layer alumina microfiltration membrane using the tape casting technique. For this purpose, investigation was undertaken to study the optimum conditions for preparation of a stable ceramic slip and to fabricate tape cast membranes of desired thickness, porosity, pore size and its distribution. Thus the powder characteristics of the starting material, composition of the slip and the sintering condition of the fabricated tapes are some of the subject matters of the present work.

Considering the importance of the alumina as an excellent thermochemically stable and chemically inert amongst the common refractory oxides as well as its easy availability it was selected as the membrane material for the present investigation. Availability of alumina in hydrated as well as dehydrated forms also makes it suitable as a general purpose membrane material. Physico-chemical characteristics of the starting powders from different sources were investigated through chemical analysis, X-ray powder diffraction, particle size and surface area measurement.

The degree of dispersion of the non plastic powder is one of the most important criterion for the preparation of stable tape casting slip which in turn is guided by the particle size distribution of the powder together with the amounts of the binder, plasticizers, dispersants and other additives. For ascertaining the optimum characteristics of the slip, rheological parameters were measured using a rotational viscometer. The flow behavior was analysed using the important parameters like relative viscosity, shear modulus etc.

Membranes are normally evaluated on the basis of pore size

and its distribution which in turn is strongly influenced by the particle size distribution of the initial raw material and the sintering condition. Thus, pore size, its distribution, pore volume were measured as functions of the above two parameters. Evolution of the pore structure including the size and its distribution during binder burn-out and sintering has been studied in details.

Possibility of the formation of intragranular and intergranular pores have been examined by pore size analysis through mercury porosimetry and determination of microstructure of the fractured surface with the help of scanning electron microscope.

Thin tape cast membranes have poor mechanical strength. Therefore, another objective of the investigation has been to design and fabricate a flat perforated ceramic ( alumina) support as the holder for this new type of membranes. The holder has been fabricated by lamination of several tape cast layers followed by sintering.

Finally the performance of the prepared membrane has been investigated by looking into the possibility of obtaining bacteria free water as required for the bio-technological laboratories using these membranes.

The permeability of the membrane is controlled by the pore size, pore volume, transmembrane pressure, and the chemical nature of the feed liquid. For this purpose permeate volume was measured in relation to pore size and pore volume of the membrane. Both positive pressure and suction across the membrane were used to study the effect of transmembrane pressure in the present investigation. The pH of the feed solution was varied from 1 to 11. From the permeate volume, permeate flux, has also been determined.

The complete plan of work for the present investigation is presented in the form of a flow chart in Fig. 3.1:

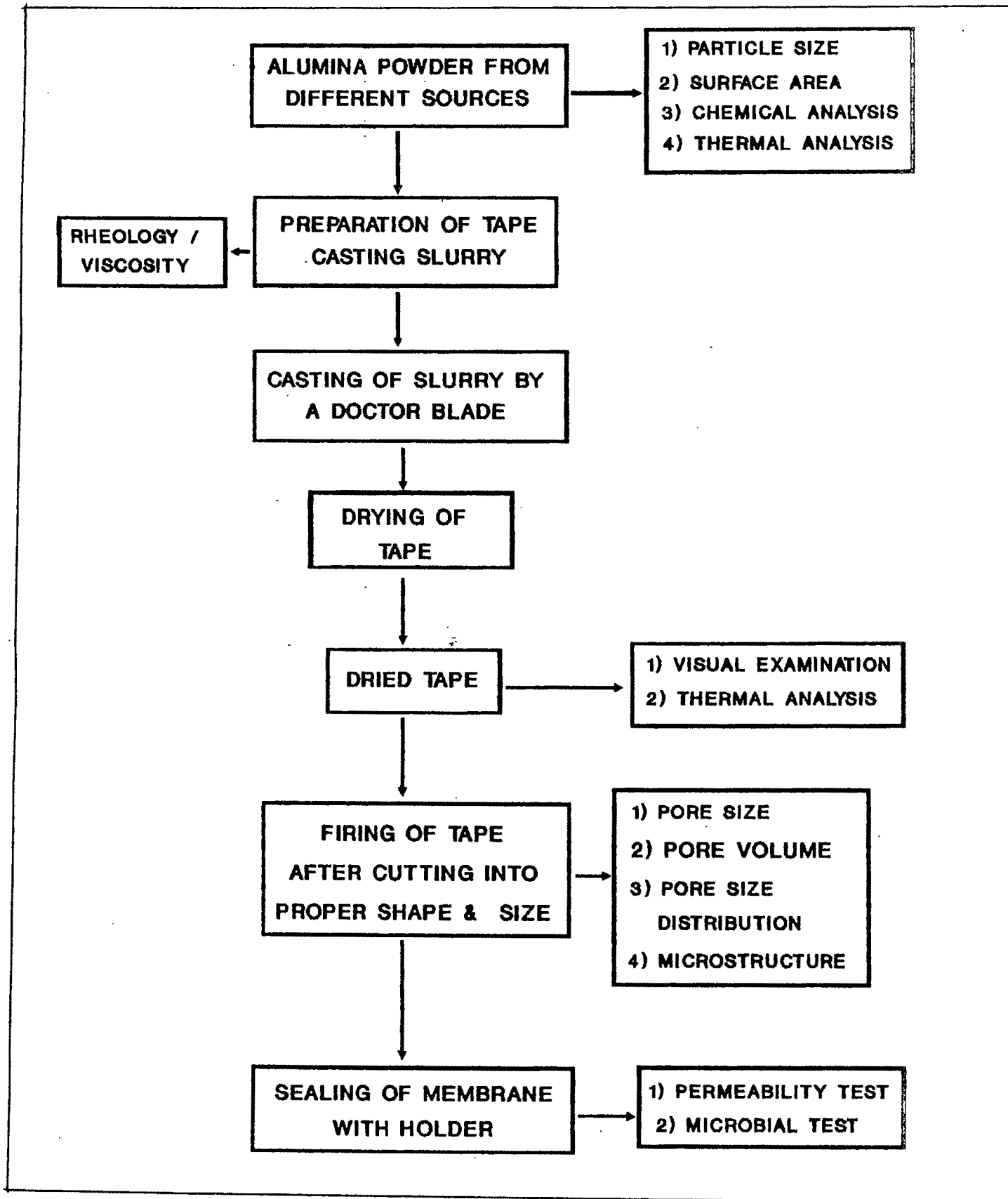


Fig. 3.1 Flow chart for the plan of the work