

Problem Formulation

3.1 Motivation for Research

Welding dissimilar metals is a challenging and exciting area of research for power generation applications. The development of Shielded Metal Arc Welding (SMAW) consumables for welding dissimilar metals is essential for widely utilizing Ni-based alloys in power generation (Siefert et al., 2016). Based on the extensive literature review and identified research gaps, the following reasons were considered as motivation for this study:

- Power plant boiler components manufactured using SMAW welding consumables and operated at high temperatures exhibited significant failure rates.
- Developing SMAW consumables to improve the mechanical properties and hot corrosion performance of the welds.
- Limited publicly available information related to the coating composition of welding electrodes to fabricate Dissimilar Welded Joints (DWJs) to achieve structural integrity without failure.

3.2 Objectives of research

The purpose of this research work is to formulate Shielded Metal Arc Welding (SMAW) electrode coatings for joining Inconel 617/SS304H dissimilar welds. The following objectives have been identified:

- Design and develop SMAW electrode coatings for welding dissimilar welds used in power plants applications using nickel-based core wire using $\text{CaO-TiO}_2\text{-SiO}_2\text{-Na}_3\text{AlF}_6$ and $\text{CaO-CaF}_2\text{-SiO}_2\text{-SrO}$ flux system.
- Characterization of the coating fluxes physicochemical, thermophysical, and wettability properties.
- Study of metallurgical and mechanical behavior investigations of fabricated dissimilar welds.
- Hot corrosion behavior study of base and dissimilar welds at high temperatures under different molten salt environments.
- Comparing and assessing the developed electrode coatings with commercially available alternatives.

3.3 Work plan opted to meet the above-stated objectives

The schematic representation of the work plan is shown in Figure 3.1

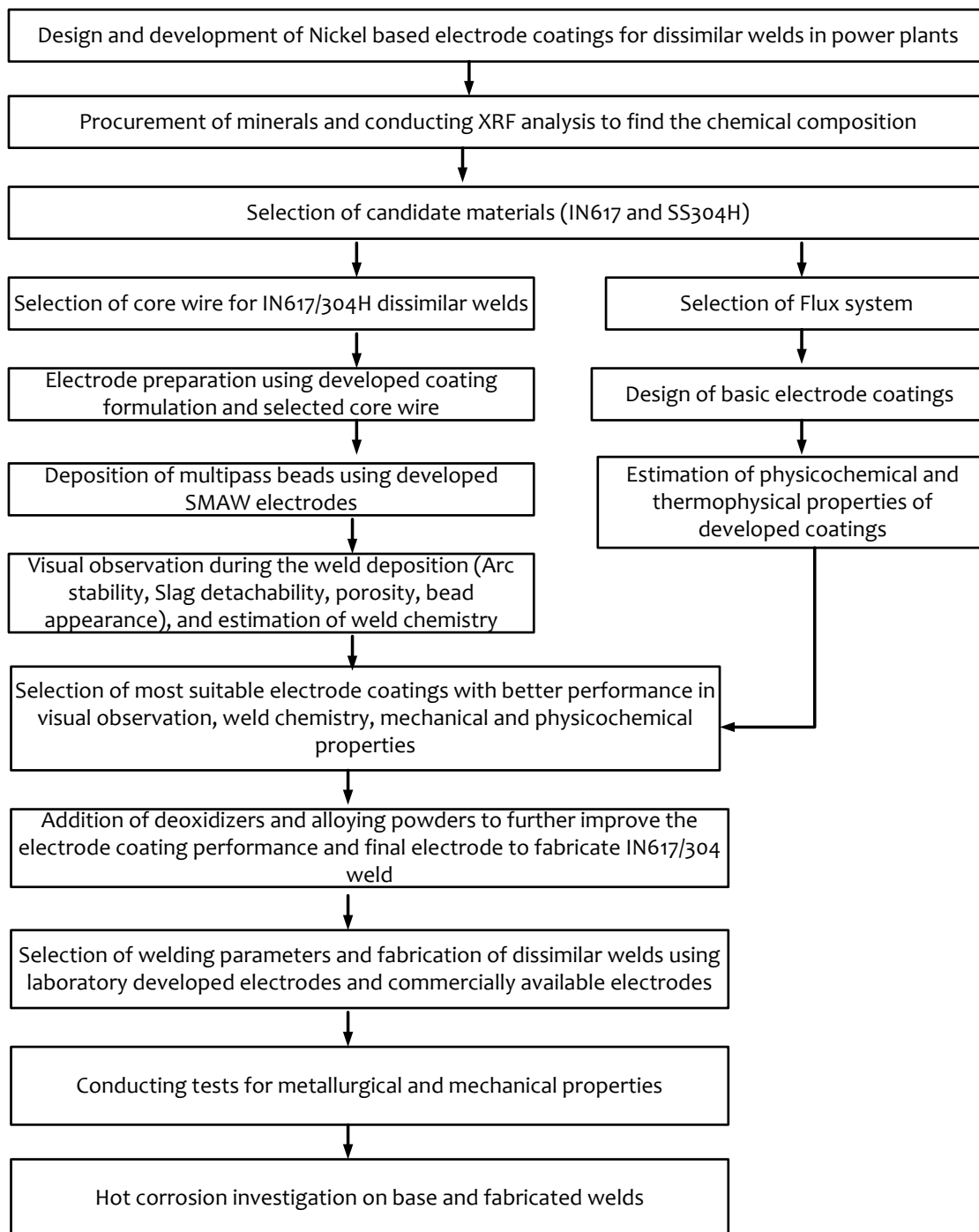


Figure 3.1 Schematic flow chart of the work plan