CHAPTER 2

OBJECTIVES OF THE INVESTIGATION

The preceding literature survey illustrated that the absorption and desorption of nitrogen during welding are complex phenomena influenced by a number of different factors, such as the nature of the species present in the arc plasma, the weld metal alloying content and the welding parameters. Most of the theoretical models currently available in literature describe nitrogen absorption and desorption from autogenous iron or carbon steel welds and may not be appropriate for describing these processes in more highly alloyed stainless steel welds. This investigation aimed at examining the influence of a number of factors on the absorption and desorption of nitrogen during the autogenous welding of stainless steel. The variables examined during the course of the investigation were selected on the basis of the preceding literature survey to quantify the role of certain factors not addressed by currently available literature, to clarify inconsistencies in the existing literature, and to investigate the interaction between these variables in practice. The influence of the following factors on the behaviour of nitrogen during the welding of stainless steel was investigated:

- the shielding gas composition,
- the base metal nitrogen content prior to welding, and
- the surface active element concentration in the weld metal.

In order to examine the influence of each of these factors on the nitrogen content of stainless steel welds, the compositions of the parent metal and the shielding gas were adjusted to produce an experimental matrix quantifying the influence of each variable individually and in combination. The experimental procedure followed during the course of this investigation is described in Chapter 3. In order to avoid the introduction of too many variables, the same welding parameters (welding current, arc length, travel speed and shielding gas flow rate) were used during all the experiments, except where otherwise indicated. Following the experimental work, a kinetic model was derived to explain the results obtained. This model is described in Chapter 5.