CHAPTER 1

INTRODUCTION

Since 1960, the considerable efforts have been made to maximize the utilization of the fish for human consumption (Sonu, 1986; Leonar Nunes et al., 1990). Decrease in supply of lean fish, particularly Alaska pollack, for surimi production forces surimi manufacturers seeking for a new source of raw material especially from underutilized fish species such as pelagic fish (Sonu, 1986). Based on consumer and economic perspectives, there has been a little success on making acceptable surimi from those pelagic fish, though the substantial improving process on gel strength of surimi from the fishes have been established since Shimizu (1965) patented his alkaline washing process. Hultin and Kelleher (2000) pointed out several limiting factors on using the dark muscle fish as surimi raw material and the primary constraint is their high content of dark muscle.

Washing conditions in conventional surimi processing, such as washing time, washing cycle, and water quality, have been modified in order to remove more muscle pigments and to improve surimi whiteness (Lin and Park, 1996; Tejada et al., 1981; Kim et al., 2005). Washing mechanically deboned chicken meat with 0.5% sodium bicarbonate or 40 mM phosphate buffer at pH 8.0 was effective for removal of meat pigment (Hernandez et al., 1986; Yang and Froning, 1992). Chen et al. (1997) reported that color of horse mackerel mince was not improved after washing with 0.5% sodium bicarbonate. Similar results were also reported for mackerel (Jiang et al., 1998). However, Chen et al. (1996) found that washing milkfish mince at alkaline pH either by using phosphate buffer or sodium bicarbonate removed fish pigment efficiently.

The pigments responsible for color of dark muscle of fish are hemoglobin and myoglobin (Bone, 1978). These proteins are well recognized as an extremely high water-soluble protein. Thus, low extractability of the soluble proteins would imply their molecular modification and/or an existence of an interaction with insoluble components of fish muscle (Hultin et al., 1995). These changes possibly occur since capture until processing. Myoglobin of milkfish and herring was less soluble after iced storage (Chen et al., 1996; Chow, 1991). Autoxidation of tuna myoglobin was coincidental with the decrease in its solubility (Chow et al., 1987). Richards and Hultin (2000) reported a sharp decrease in oxygenation of trout hemoglobin when pH was lowered from 7.5 to 6.0 with an increase in lipid oxidation rate in washed cod mince. These studies suggested that decrease in pH of fish muscle during postmortem handling or storage may favor the modification of proteins, especially hemoglobin.

The alkaline solubilization process is the new processing on making surimi recently developed at the University of Massachusetts Marine Station. With this process, fish homogenate will be brought to pH of 10.8 in order to solubilize muscle protein. Insoluble components at this pH are separated by centrifugation. The supernatant is then readjusted its pH to isoelectric point of muscle protein to precipitate it. Many advantages of producing surimi with this novel process comparing to with the conventional process include higher protein recovery and better gelling property of the surimi (Hultin and Kelleher, 2001; Hultin and Kelleher, 1999). Alkaline solubilization process may provide the highest extractable heme protein. Recently, Kristinsson and Hultin (2003) reported that no conformational changes in trout hemoglobin was observed after an alkaline treatment. Nevertheless, properties and stability of fish heme proteins are diverse and associated with fish living environment (Brunori, 1975). Hemoglobin contamination in fish muscle may

cause the discoloration of fish mince and its products. Some factors affecting the binding of hemoglobin with muscle and the removal of hemoglobin from the fish muscle should be therefore taken into consideration to improve the whiteness of fish mince or surimi as well as to reduce the chemical reactions associated with the presence of hemoglobin in fish muscle.