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On the environmental importance of mangroves

Mangroves and the Development of the Chemical Industry in Brazil

Mangrove products have been historically used by many indigenous populations in tropical coastal areas worldwide. One of these is the use of mangrove ashes to extract alkali for soap production. However, until recent times, few examples of industrial uses (i.e. transformation of raw material by artificial, non-artisanal means into secondary products) of mangrove were restricted to the use of tannins in the leather industry (Lacerda, 1999). We report here one of the first, if not the very first, example of industrial use of mangrove products, which was also regarded as one of the initial steps in the development of the Brazilian chemical industry: the development in the early 19th century of an industrial process of hard soap production based on mangrove leaves ash in Rio de Janeiro, Brazil (Lacerda, 1999).

Soap has been known by mankind for about 2,000 years, as a mixture of alkali and fatty materials, in general animal fat. Before the invention of the Le Blanc and more recently the Solvay process of saponification, natural sources of alkali were obtained by evaporation of naturally alkaline waters, relatively rare and time consuming or the leaching of bulk wood ash, which gave very low yields. These two sources hampered the development of an actual, large-scale industrial process of soap making, keeping its production as an artisanal method for millennia (Shreve & Brink, 1977).

In this context, mangroves played a key, but unsuspected role in the industrial production of soap and in the development of 19th century Brazilian chemical industry. On 25th January 1812, Prince D. João VI of Portugal and Brazil founded the first Practical Chemistry Laboratory of Brazil in Rio de Janeiro, with the objective of discovering applications for the different natural materials of the Portuguese colonies to industry and commerce, particularly to balance the bilateral commerce with China, and decrease the dependence on imported goods (Rheinboldt & Azevedo, 1955). One of the first tasks of the Laboratory was the development of an alternative process to produce hard soap, in order to decrease the Kingdom expenses with importing soda. Brazil consumed a type of low-quality soft soap imported in small barrels from São Tome and Principe Islands. The idea was to produced hard soap which could be sold in bars. The first invention of the recently established laboratory, was the utilization of mangrove ashes, particularly rich in NaOH, to produce good-quality hard soap, a process developed under the directorship the Brazilian Bachelor and Priest Francisco Vieira Goulart (1765-1839), formerly Professor of Moral and Rational Philosophy in São Paulo city and member of the Academy of Sciences of Lisbon, which resulted in reduced prices of soap relative to the then imported product from England (Schwartzman, 1979). The processes used mangrove ashes with nearly 50% of soda and 50% common salt. The alkaline leaching of these ashes were mixed (about 1:1) with the alkaline leaching of non-maritime plant ashes (Santos, *in press*).

Mangrove ashes substituted easily the imported soda and had the advantage of being abundant and with a very low cost of production, obtained along the then extensive mangrove forests of Guanabara Bay, surrounding Rio de Janeiro city, since these forests were protected by a royal decree from D. Manuel José I of Portugal in 1760, to be used as raw material sources for the leather industry (Lacerda, 2002). Impressed by the extensive mangrove forests of the Brazilian coast, Francisco Vieira Goulart also proposed the large-scale extraction of alkali from mangrove leaves.

Although artisanal production of soap using mangrove ashes were probably known by indigenous populations of the Atlantic coast of Africa (Field, 1997), the "mangrove" soap produced at the Practical Chemistry Laboratory was probably the first to be produced at an industrial scale and certainly was the first industrial product successfully exported from Brazil to other Portuguese colonies (Rheinboldt & Azevedo, 1955). Although, the invention of the Le Blanc process of a cheap alkali production based on sodium sulfate burning with coal followed by the Solvay method of saponification, which made uneconomic the process based on mangrove ashes, the use of this mangrove product had an early relevant importance for the development of the chemical industry in Brazil

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