Green Chemistry Synthesis of the Natural Indigo Pigment from Plants

Prof. Zvi C. Koren
Director, The Edelstein Center for the Analysis of Ancient Artifacts
Department of Chemical Engineering, Shenkar College of Engineering, Design and Art, Ramat Gan, Israel

Abstract

The blue-violet indigo pigment is famous for the dyeing of modern and fashionable blue-jeans and other clothing and textile furnishings. However, not only is this pigment important in today's world, but natural indigo, which was produced from the leaves of certain plants, was used in textile dyeing thousands of years ago, from at least four millennia in the past. The indigo pigment (also known as "indigotin") is produced from the precursors in the leaves of all indigo-producing plants. These precursors are indoxyl derivatives with different attached sugar moieties (glycosylated forms of indoxyl). Hydrolysis of these precursors will cleave the sugar entities and leave the indoxyl derivatives to further react with oxygen and consequently to produce colored compounds. The main colorant product is indigo, with usually some reddish indirubin (an isomer of indigo) and yellowish isatin (an oxidized form of a "half-indigo" molecule).

Keywords

Natural dyes and pigments, plant colorants, indigo, indirubin, isatin.