Utilization of some activated carbon for the removal of organic pollutants

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Dyes are soluble at some stage of the application process, whereas pigments, in general, retain essentially their particulate or crystalline form during application. A dye is used to impart color to materials of which it becomes an integral part. An aromatic ring structure coupled with a side chain is usually required for resonance and thus to impart color [1]. (Resonance structures that cause displacement or appearance of absorption bands in the visible spectrum of light are responsible for color). Correlation of chemical structure with color has been accomplished in the synthesis of dye using a chromogen-chromophore with auxochrome. Chromogen is the aromatic structure containing benzene, naphthalene, or anthracene rings. A chromophore group is a color giver and is represented by the following radicals, which form a basis for the chemical classification of dyes when coupled with the chromogen: azo (–N=N–); carbonyl (=C=O); carbon (=C=C=); carbon-nitrogen (>C=NH or –CH=N–); nitroso (–NO or N–OH); nitro (–NO2 or =NO–OH); and sulfur (>C=S, and other carbon-sulfur groups). The chromogen-chromophore structure is often not sufficient to impart solubility and cause adherence of dye to fiber. The auxochrome or bonding affinity groups are amine, hydroxyl, carboxyl, and sulfonic radicals, or their derivatives. These auxochromes are important in the use classification of dyes.Classification of dyes according to use:• Acetate rayon dyes: developed for cellulose acetate and some synthetic fibers.• Acid dyes: used for coloring animal fibers via acidified solution (containing sulfuric acid, acetic acid, sodium sulfate, and surfactants) in combination with amphoteric protein.• Azoic dyes: contain the azo group (and formic acid, caustic soda, metallic compounds, and sodium nitrate); especially for application to cotton.• Basic dyes: amino derivatives (and acetic acid and softening agents); used mainly for application on paper.• Direct dyes: azo dyes, and sodium salts, fixing agents, and metallic (chrome and copper) compounds; used generally on cotton-wool, or cotton- silk combinations.• Mordant or chrome dyes: metallic salt or lake formed directly on the fiber by the use of aluminum, chromium, or iron salts that cause precipitation in situ.• Lake or pigment dyes: form insoluble compounds with aluminum, barium, or chromium on molybdenum salts; the precipitates are ground to form pigments used in paint and inks.• Sulfur or sulfide dyes: contain sulfur or are precipitated from sodium sulfide bath; furnish dull shades with good fastness to light, washing, and acids but susceptible to chlorine and light.• Vat dyes: impregnated into fiber under reducing conditions and reoxidized to an insoluble color.• Disperse dyes: is originally developed for the dyeing of cellulose acetate. They are substantially water insoluble. The dyes are finely ground in the presence of a dispersing agent then sold as a paste or spray dried and sold as a powder. They can also be used to dye nylon, triacetate, polyester and acrylic fibers. In some cases a dyeing temperature of 130 deg C is required and a pressurized dye bath is used. The very fine particle size gives a large surface area that aids dissolution to allow uptake by the fiber. The dyeing rate can be significantly influenced by the choice of dispersing agent used during the grinding.Disperse dyes have low solubility in water, but they can interact with the polyester chains by forming dispersed particles. Their main use is the dyeing of polyesters, and they find minor use dyeing cellulose acetates and polyamides. The general structure of disperse dyes is small, planar and non-ionic, with attached polar functional groups like -NO2 and -CN. The shape makes it easier for the dye to slide between the tightly-packed polymer chains, and the polar groups improve the water solubility, improve the dipolar bonding between dye and polymer and affect the color of the dye. However, their small size means that disperse dyes are quite volatile, and tend to sublime out of the polymer at sufficiently high temperatures.Pollution Prevention and ControlEvery effort should be made to substitute degradable and less toxic ingredients for highly toxic and persistent ingredients. Recommended pollution prevention measures are to [2]:• Avoid the manufacture of toxic azo dyes and provide alternative dyestuffs to users such as textile manufacturers.• Meter and control the quantities of toxic ingredients to minimize wastage.• Reuse by-products from the process as raw materials or as raw material substitutes in other processes.• Use automated filling to minimize spillage.• Use equipment wash down waters as makeup solutions for subsequent batches.• Return toxic materials packaging to supplier for reuse, where feasible.• Find productive uses for off-specification products to avoid disposal problems.• Use high-pressure hoses for equipment cleaning to reduce the amount of wastewater generated.• Label and store toxic and hazardous materials in secure, bonded areas. A dye and pigment manufacturing plant should prepare and implement an emergency plan that takes into account neighboring land uses and the potential consequences of an emergency. Measures to avoid the release of harmful substances should be incorporated in the design, operation, maintenance, and management of the plant.