China-Egypt supercritical CO_2 Dyeing international co-operation laboratory

مقدمة:

حتي الان لم يتم تصميم معمل متكامل للبحث والتطوير فيما يتعلق بتكنولوجيا السوائل الحرجة, وبشكل أساسي فأن تقنية ثاني اكسيد الكربون الفوق حرج تستخدم لاستخلاص وتنقية وصباغة المنسوجات في مصر.

ان تطبيق تكنولوجيا ثاني اكسيد الكربون الفوق حرج في الصناعة وخاصة صناعة المنسوجات سوف يحد من عمليات معالجة المياه التقليدية الباهظة التكاليف, فضلا عن كونه من التطبيقات الفعالة الصديقة للبيئة والتي تهدف الي تطوير كلا من الخصائص الادائية والوظيفية لمنتجات المنسوجات المصرية.

الاجهزة الموجودة بالمعمل واستخداماتها

High throughput analysis supercritical fluid chromatography

A supercritical fluid chromatography system, such as a mobile phase medium, can rapidly perform separations without any drop in separation efficiency, even at fast flow rates, due to a rapid mass transfer inside the column when compared with high-speed liquid chromatography. In addition, when carbon dioxide is used as the medium, gasification will occur keeping the separated and fractionated sample at a constant temperature, making this technique capable of highly efficient refining with few post-processing hassles, such as the elimination of solvents after preparative isolation. This offers a host of advantages, including cost cuts related to the expense of purchasing and discarding organic solvents, high throughput analysis, and rapid preparative isolation over a short period of time. SFC is capable of varying the three parameters of pressure, temperature, and modifier solvent volume when separating oligomers and constituents with differing characteristics.

Supercritical fluid extraction (SFE) system

Supercritical fluid extraction (SFE) is a technique that uses supercritical fluid as an extraction medium. Methods employing supercritical carbon dioxide as an extraction medium have many advantages and are used in a variety of fields. Extraction by means of supercritical carbon dioxide can improve efficiency, including shorter extraction times and simplified procedures, when compared with extraction techniques that employ organic solvents. At the same time, it offers easier solvent elimination and concentration procedures.

Supercritical carbon dioxide system (SCF)

The textile industry is putting significant efforts into its social obligation to reduce the large amount of waste discharged into the environment during dyeing. Due to environmental impacts, supercritical fluids have very low surface tension and high diffusion; they can easily enable penetration into the textile fibrous structure. The supercritical fluid dyeing method has some advantages to water-based dyeing, such as solubility of dyes can be controlled by pressure, allowing possible control of the dyeing strength and color, contaminated wastewater streams are not produced, and washing and then drying of the dyed fabric is not substantial, supercritical fluid and the remain in the cell of solid textile dye can be reused after dyeing. So, the dyeing step is shorter than that of conventional methods.

Infra colour dyeing machine

Dyeing various types of fabrics using water.

HORIZONTAL PADDING MANGLE (DIGITAL MODEl)

Using in padding textiles in finishing process.

Spectrophotometer (Japan; model CM- 3600)

Using in measure color strength and color parameters of the dyed and printed samples and the following CIELAB coordinates: lightness (i*), chroma (c*), hue (h), the degree of redness (+ve) and greenness (-ve) (a*), and the degree of yellowness (+ve) and blueness (-ve) (b*).

High temperature Steamer Model H-TU

The laboratory High temperature steamer, type HT-U, has been developed primarily to simulate conditions of saturated steaming, high temperature steaming and drying curing on laboratory scale.

FABRIC WASHING AND FASTNESS MACHINE 8x500-L FASTNESS EQUIPMENT

This machine is ideally suited for checking the color fastness for domestic washing, commercial dry cleaning and bleaching based on various tests methods as per ISO, BS specifications.

Tensile strength (multi test 1-d)

Used in measuring tensile strength of various types of fabrics.

Measured to Centre line of the force gauge

Measured with a force gauge and short extension rod fitted.

Raman spectroscopy

Used in chemistry to provide a structural fingerprint by which molecules can be identified.

Used to observe vibrational, rotational, and other low frequency modes in a system.

Ultrasonic device. (ultrasonic water bath)

-Used in Degassing and defoaming of liquids.

-Used as ecofriendly technique in enhancing dyeing performance.

- Used in removing small suspended gas- bubbles from the liquid and reduces the level of dissolved gas below the natural equilibrium level.

Standard tests in the laboratory

Wash fastness

Rubbing fastness

Color strength

Tensile strength

Raman spectroscopy

الرسائل التى تم تسجيلها في تقنية السوائل الحرجة والتي يتم فيها استخدام المعمل

الاسم	عنوان الرسالة	الوظيفة
حنان جمال ابراهيم السيسي	**Clean technologies for dyeing fabrics** **(Utilization of supercritical carbon dioxide as a green alternative to water based dyeing).** *التكنولوجيا* النظيفة لصباغة الالياف (الاستفادة من ثانى أكسيد الكربون الفوق حرج كبديل أخضر للصباغة القائمة على الماء).	**مدرس مساعد بقسم طباعة المنسوجات والصباغة والتجهيز – كلية الفنون التطبيقية.**
سالي رؤوف سيد أحمد	**Eco-approach for coloration and finishing of textiles using nanoparticles.** منهاج صديق للبيئة لتلوين وتجهيز المنسوجات باستخدام جزيئات النانو.	**باحثة بقسم طباعة المنسوجات والصباغة والتجهيز- كلية الفنون التطبيقية.**

هبة مجدي سرور	**Study towards the development of textile dyeing using the green supercritical fluid technology.** دراسة لتطوير صباغة المنسوجات باستخدام تقنية السوائل الفوق حرجة الصديقة للبيئة.	**مدرس مساعد بقسم طباعة المنسوجات والصباغة والتجهيز – كلية الفنون التطبيقية.**
مني مصطفي علي السلامونى	**Study on some pigment producing actinomycetes and their application in dyeing of textiles.** دراسة علي بعض الاكتينوميسيتات المنتجة للاصباغ وتطبيقها في صباغة المنسوجات.	**اخصائي معمل ثالث – بكلية الفنون التطبيقية.**
نيفين محمد هاشم أبو سريع التلباني	**Photo spectral studies of biologically active heterocyclic and their relevant compounds.** دراسات ضوئية طيفية لمركبات حلقية غير متجانسة ذات تأثيرات بيولوجية والمركبات التى تمت اليها.	**مدرس مساعد بقسم الكيمياء- بكلية العلوم**

الابحاث التى تم نشرها من خلال المعمل

- Abou Elmaaty, T., El-Taweel, F., Elsisi H., 2018. Water-free Dyeing of Polyester and Nylon 6 Fabrics with Novel 2-Oxoacetohydrazonoyl Cyanide Derivatives under a Supercritical Carbon Dioxide Medium, Fiber. & Polym. 19, 887-893.
- Abou Elmaaty, T., El-Taweel, F., Elsisi, H., Okubayashi S., 2018. Water-free dyeing of polypropylene fabric under supercritical carbon dioxide and comparison with its aqueous analogue, J. Supercrit. Fluids 139, 114–121.

- Abou Elmaaty, T., Sofan, M., Elsisi, H., Kosbar, T., Negm, E., Hirogaki, K., Tabata, I., Hori, T., 2019. Optimization of an eco-friendly dyeing process in both laboratory scale and pilot scale supercritical carbon dioxide unit for polypropylene fabrics with special new disperse dyes, J. CO_2 Util. 33, 365–371.
- Abou Elmaaty, T., Sofan, M., Kosbar, T., Elsisi, H., and Negm I., 2019. Green Approach to Dye PET and Nylon 6 Fabrics with Novel Pyrazole Disperse Dyes under Supercritical Carbon Dioxide and Its Aqueous Analogue. Fiber. & Polym. 20, 2510-2521.

الجهات البحثية التي تتعاون مع معمل السوائل الحرجة خارجية – داخلية

الجهات الخارجية

Dalian – poly technique University, China.

Kyoto Institute of Technology, Japan.

Univ. of Fukui, Japan.

الجهات الداخلية

المركز القومي للبحوث

كلية الزراعة – جامعة دمياط.

كلية العلوم – جامعة دمياط.

كلية التربية النوعية – جامعة دمياط