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Introduction of Computational Thin-Layer Chromatography

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ABSTRACT: Rapid analysis of various heavy metal ions from the environmental sample has been carried out using the Super-Saragraphy-831(SS-831) software (© SW-10774/2018 India). The separation was carried out on a thin film of aminoplast polymer. The identification with retention factor value was carried out using Super-Saragraphy 831 software. The proposed method was successfully applied for identification and separation of heavy metals from river water, industrial wastewater as well as from bore well water.

Keywords: Aminoplast; mobile phase; Super-Saragraphy; river water & metals.

INTRODUCTION: Thin layer chromatography widely used for separation and identification of various components form multicomponent systems. Various adsorbents also developed which gives a rapid separation of various components. Toxic metal ions from various sample successfully carried out using aminoplast [1], using a bismuth silicate layer [2]. There is also the development of micellar chromatography. Various surfactant based mobile phase systems successfully utilized for the separation of metal cations [3][4]. From literature survey, it is observed that there are various developments in adsorbent and mobile phase, but still, all these systems required maximum time space for identification and calculation of retention factor of components.

Current articles deals with the application of Super-Saragraphy -831 software for rapid analysis of components from multicomponent systems. The software is developed by Dr. Sarang S. Dhote and copyrighted in 2018.

Super-Saragraphy-831: It is language based software which can easily run on windows PC. Basic language used in for this development of software is MTLAB. In MATLAB there are various in built tool that can useful for various research works. Following flowchart were used for this work.

MATERIALS AND METHODS:

Chemicals and Reagents: Silica gel 'G' was obtained from Merk, Dimethylglyoxime, dithizone, potassium ferrocyanide, carbon tetrachloride, methanol, ethanol, propanol, butanol, glacial acetic acid, and HCl were obtained from SD Fine India. All other chemicals were of analytical reagent grade.

Metal ion Studied: Zn^{2+}, Cd^{2+}, Hg^{2+}, Fe^{3+}, Ni^{2+}, Co^{2+}, and Cu^{2+}

Test Solution: TLC was performed using a standard aqueous solution (1%) of the chloride, nitrate or sulfate salts of the metal ions listed.

Stationary Phase: Silica Gel -G.

Mobile Phase: Ethanol in water (8:2 V/V).

[Flowchart]

Super-Saragraphy-831: After the development of chromatographic plates following procedure are followed by the author according to flowchart.

Figure 1: Basic GUI of Super-Saragraphy-831.

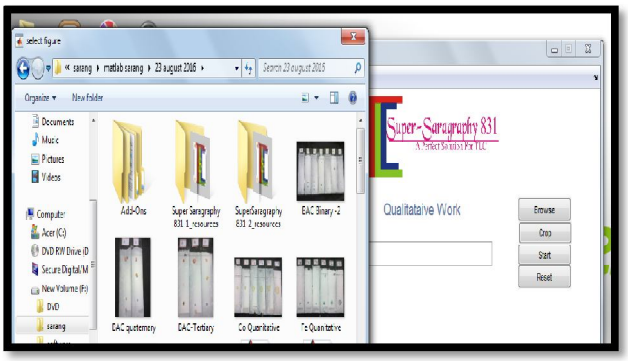

Figure 2:Selection of Image From Folder.

Figure 3: Selected Image in New Window

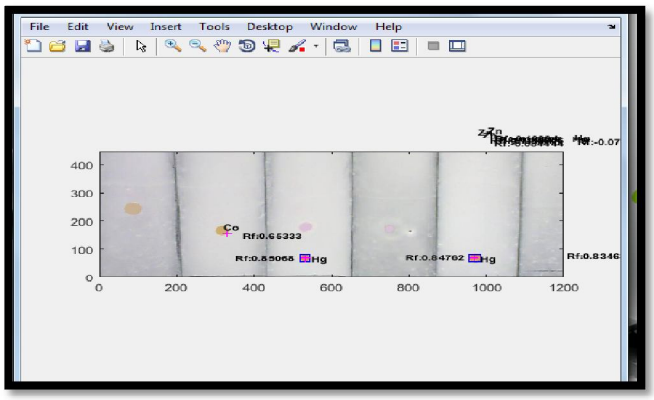

Figure 4: Chromatographic plate with Result.

RESULTS: Proposed method successfully utilized for identification of heavy metals from various sample like river water, spiked water and Industrial waste. Results were compared with old classical method. Table no. 1 shows comparative R_f Value of metal ions.

Table 1: Comparative study of Rf values of metal.

Metal	Old Classical Method (R_f Value)	Super-Saragraphy-831 (R_f Value)
Lab Sample		
Co^{2+}	0.65	0.65333
Ni^{2+}	0.51	0.50213
Cu^{2+}	0.19	0.19452
Fe^{3+}	0.34	0.34450
Hg^{2+}	0.86	0.85068
Cd^{2+}	0.72	0.71845
Zn^{2+}	0.32	0.31458
River Sample		
Co^{2+}	0.62	0.63147
Ni^{2+}	0.55	0.54781
Cu^{2+}	0.19	0.20134
Fe^{3+}	0.36	0.36147
Hg^{2+}	0.89	0.88478
Cd^{2+}	0.75	0.73581
Zn^{2+}	0.33	0.33001
Spiked Sample		
Co^{2+}	0.59	0.60147
Ni^{2+}	0.53	0.52147
Cu^{2+}	0.20	0.18954
Fe^{3+}	0.34	0.32147
Hg^{2+}	0.87	0.86458
Cd^{2+}	0.76	0.75423
Zn^{2+}	0.32	0.34711
Industrial Sample		
Co^{2+}	0.61	0.61258
Ni^{2+}	0.54	0.54712
Cu^{2+}	0.21	0.20146
Fe^{3+}	0.32	0.31456
Hg^{2+}	0.87	0.86314
Cd^{2+}	0.74	0.73214
Zn^{2+}	0.33	0.34781

CONCLUSION: From table no. 1 it is observed that results of SS-831 were similar with results obtained by using old classical method. SS-831 software was reliable and convenient for identification of metals from various samples. This software can easily run on any smart devices. For analysis no any special skill required. One of the biggest advantage of this software is that this methods gives quick results so that

software can be used for rapid analysis for bulk samples. SS-831 is currently in developmental stage, step by step development is carried out. This method gives wide application in future development of thin layer chromatography.

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