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# DEVELOPMENT OF A NOVEL CROSSLINKED POLYMER FOR DYES ADSORPTION FROM CONTAMINATED AQUEOUS SOLUTIONS

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## *Introduction*

Residual dyes released annually as industrial waste without any pre-treatment have become a global problem, significantly contributing to environmental pollution. One of the synthetic cationic dyes often found in industrial effluents is crystal violet (CV). CV has various applications in a wide range of fields, such as medicine, detergents, textile, fertilizers industries or printing facilities. On the other hand, human exposure to high concentrations of CV can induce acute or chronic effects, affecting the nervous, locomotory, respiratory, and reproductive systems. Thus, CV removal from effluents has currently become a global concern.

Herein, we report the preparation and environmental application of a novel polymer (**PAAA-*CL*-XLD)**: poly (benzofurane-*co*-arylacetic acid) (**PBAAA**) crosslinked with *p*-xylenediamine (**XLD**). The innovative synthesized material was structurally and morphologically characterized using Fourier-Transform Infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). Afterwards, **PAAA-*CL*-XLD** was applied in CV adsorption from aqueous solutions. CV concentrations were measured by UV-VIS spectroscopy. We investigated the effects of two adsorption parameters (preliminary dye concentration and contact time) to establish the optimum sorption requirements.

## *Materials and methods*

The novel material was investigated by SEM and FTIR, while UV-VIS was employed to determine the CV concentrations. The ratio of reagents (**PBAAA: XLD**) was varied, thus obtaining 3 types of samples: **PAAA-*CL*-XLD_2** (2:1), **PAAA-*CL*-XLD_2** (1:1) and **PAAA-*CL*-XLD_3** (1:2). Regarding the adsorption behaviour, we performed experiments using 23 different CV concentrations (1-500 mg/L) and 8 contact times 5, 15, 30, 45, 60, 90, 120, 150, 180 minutes). Equilibrium isotherms and kinetic models were applied to describe the CV adsorption mechanism onto the crosslinked polymer.

***Results and conclusions***

The adsorption results indicated higher CV removal efficiencies and sorption capacities in the case of **PAAA-*CL*-XLD_2** as compared to **PAAA-*CL*-XLD_1**, most probably due to the inverse proportionality between the material's granulometry and the specific surface available for retaining contaminants. In general, the adsorption efficiency is starting to decrease at CV concentrations above 300 mg/L. However, an improvement in the dye removal efficiency could be noticed when the contact time was increased (Figure 1).

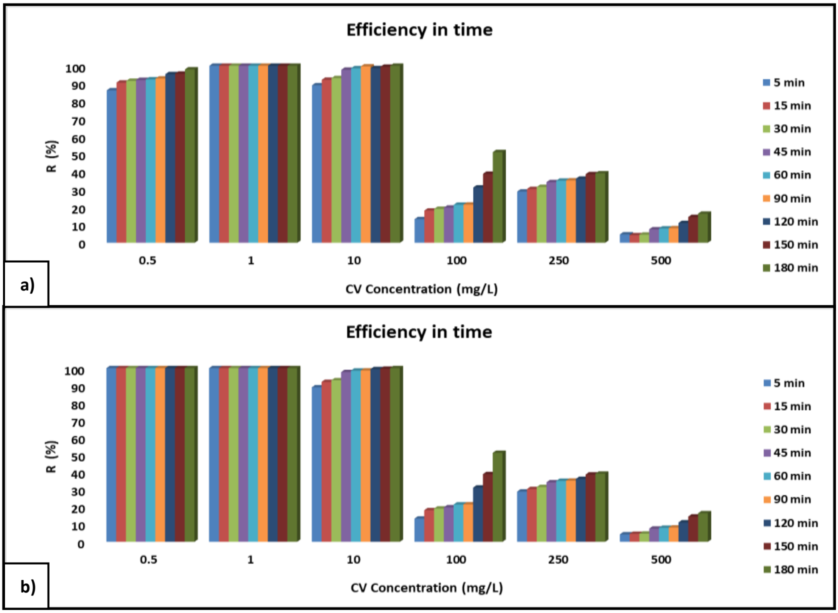


**Fig. 1.** The influence of contact time on the CV adsorption efficiency via PAAA-*CL*-XLD_1 (a) and PAAA-*CL*-XLD_2 (b)

In conclusion, a new crosslinked polymer based on **PBAAA** was developed through non-catalytic synthesis methods. The resulting material exhibited good crystal violet adsorption properties, recommending it for environmental applications in treating dye-contaminated industrial effluents.

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