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STRUCTURAL/TEXTURAL CHARACTERIZATION AND ADSORPTION PROPERTIES OF ALGERIAN POZZOLAN FOR REMOVAL OF MALACHITE GREEN FROM AQUEOUS SOLUTION

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INTRODUCTION

The water resource is currently threatened by pollution because all human activities lead to the production of synthetic organic chemical compounds in the environment. One of the main pollutants is synthetic dyes used in the textile industry, as well as food dyes such as rhodamine B, metanil yellow, and malachite green**.** To remove dyes and other colored contaminants from wastewater, we need green chemistry. i.e., processes that lead to the use of more environmentally friendly adsorbents that are both cheap and renewable**.** So, in this study**, pozzolan**, a natural **Algerian** siliceous volcanic filler from the **Ain-Temouchent** region (**Beni-saf**), was used as a renewable, available, and inexpensive adsorbent for the removal of the textile dye **malachite green** from aqueous solutions.

MATERIALS

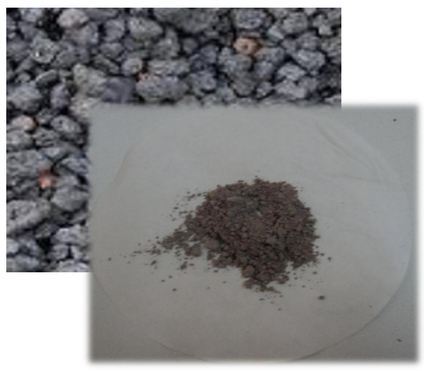


Figure 1: Pozzolan (**AP**)- Absorbent

MG ADSORPTION

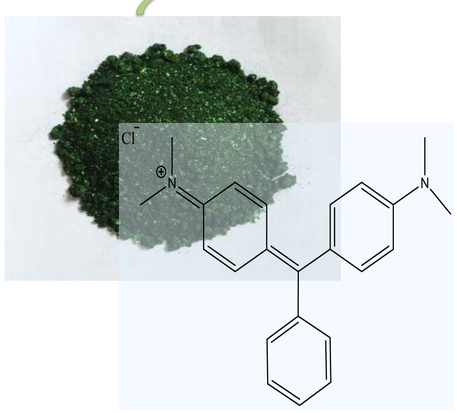
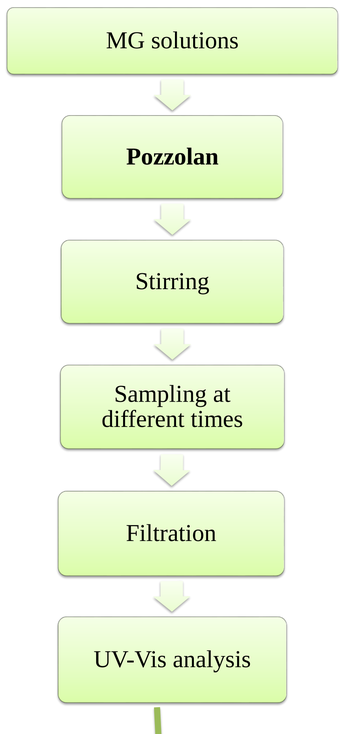


Figure 2: Malachite green dye (**MG**)



RESULTS AND DISCUSSION

Table 1: Chemical composition by X-ray fluorescence (**XRF**)

Oxyde	SiO_2	Al_2O_3	Fe_2O_3	M_nO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	SO_3	LOI
PM (%)	44 ,31	16,01	8,12	0,14	4,29	9,78	1,45	1,91	0,66	0,04	9,72

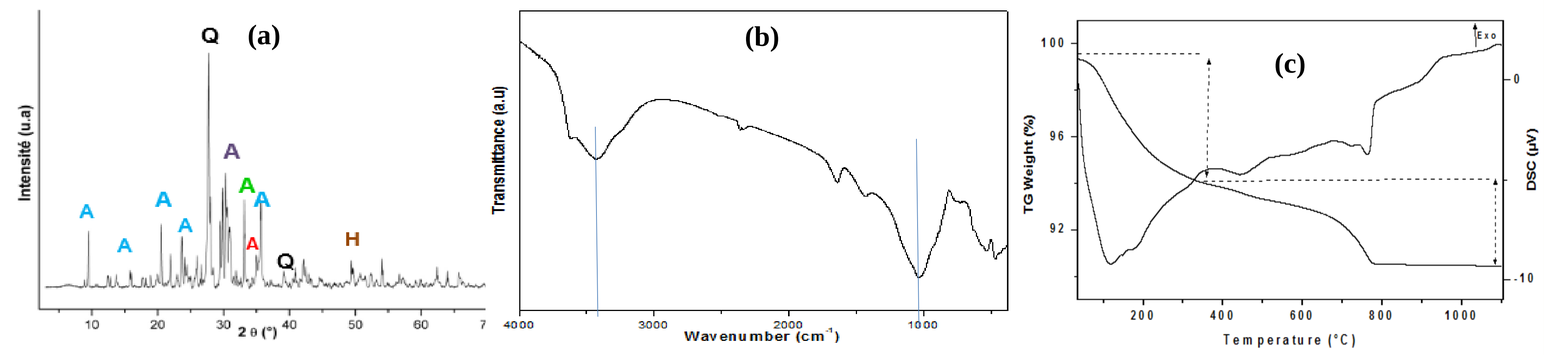


Figure 3: **(a)** X-ray diffraction, **(b)** FT-IR, **(c)** TG/DSC of Pozzolan.

Table 2: Textural properties and CEC of Pozzolan.

AP	SSA[a] (m^2/g)	V_t[b] (cm^3/g)	D_{PDFT}[c] (nm)	CEC[d] (meq/100g)
	68	0.071	1.7	25

[a]: Specific surface area, [b]: Total pore volume, [c]: Pore diameter determined by DFT, [d]: Sum of exchanged cations measured by ICP-OES.

- From the **XRD** analyses , the PA contains crystalline minerals. according to the most intense peaks the AP is composed of: quartz, hematite, anorthite and augite, which confirms the results of **XRF** (high content of SiO_2, Fe_2O_3 and Al_2O_3 oxides).
- The **FT-IR** spectrum of the AP shows a broad peak at wavenumbers [1007-1050 cm^{-1}] which is attributed to the Si-O and Al-O vibration. The band displayed at 3456 cm^{-1} is attributed to the stretching vibration of the -OH bond.
- high thermal stability up to 600 °C.
- A specific surface of 68 m^2/g and a slight porosity, low CEC (25 meq/100g).

Adsorption

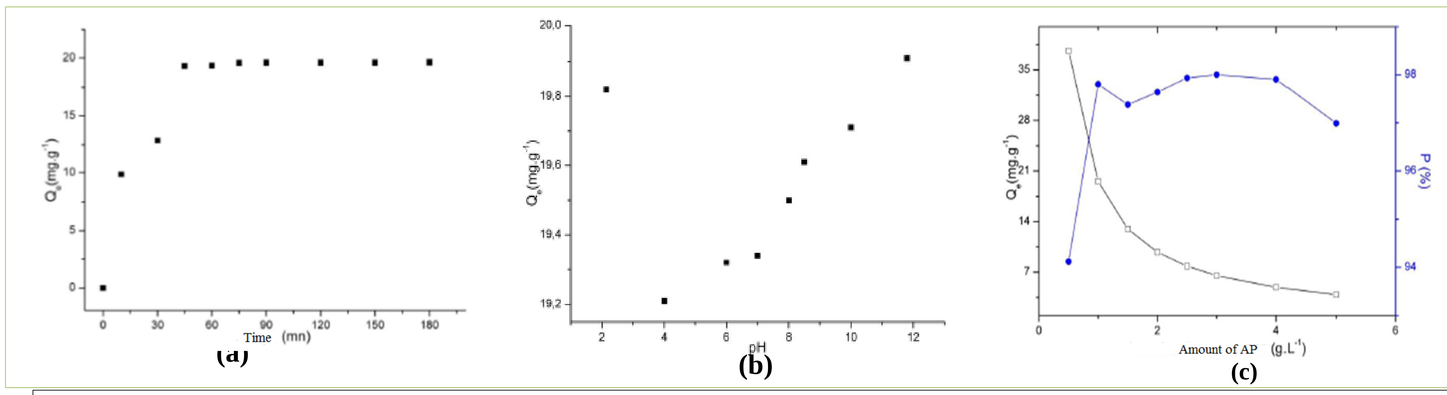


Figure 4: Effect of experimental parameters in **MG** adsorption onto pozzolan material: **(a)** Initial pH , **(b)** Contact time , **(c)** Absorbent dose ,

- Optimal experimental conditions:
  -Initial solution pH= 8-8,5 -Contact time = 75min -Adsorbent dose = 1g/L
- The adsorption isotherms: giving a value of $R^2 < 1$. This means that the adsorption is more important for low concentrations and a progressive saturation of the solid.

Table 4: Langmuir and Freundlich isotherm parameters of MG adsorption on pozzolan

Paramètres de Langmuir			Paramètres de Freundlich		
Q_m (mg/g)	K_L (L/mg)	R^2	K_F(mg/g)	1/n (L/g)	R^2
64,02	0,59	0,88	22,45	0,71	0,93

CONCLUSION

Algerian pozzolan a natural product used has a bleaching power on the green of malachite with a percentage of efficiency of adsorption and bleaching of VM of 99%.