

# SUMMARY

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The original work presented in this thesis was undertaken with the primary objective of synthesizing new polymeric materials based essentially on Alhagi residues to be used as adsorbent materials.

To achieve the goal, Alhagi residues was subjected to grafting reaction using MAA/AN monomer in presence of dimethyl sulfoxide as solvent and  $\gamma$ -irradiation as initiator.

The so-obtained grafted Alhagi residues was treated with hydroxyl amine hydrochloride in alkaline medium to obtain amidoximated poly (MAA/AN)-grafted Alhagi residues.

In short, the work comprises the following investigations

1. Estimation of cellulose content in Alhagi residues.
2. Studying all factors affecting grafting of MAA/AN on Alhagi residues.

These factors include:

- radiation dose
  - monomer compositions and concentration
3. Characterization of the grafted samples using:
    - FT-IR spectroscopy
    - SEM
    - Estimation of nitrogen content
    - Estimation of carboxyl content.
  4. Treatment of grafted Alhagi residues with hydroxyl amine in alkaline medium to obtain amidoximated poly (MAA/AN) –grafted Alhagi residues.

5. Characterization of amidoximated poly (MAA/AN) grafted Alhagi residues  
using:

- FT-IR spectroscopy
- SEM
- Estimation of percent solubility in distilled water
- Estimation of nitrogen content
- Estimation of carboxyl content

6. Utilization of the so-obtained amidoximated poly (MAA/AN) –grafted Alhagi residues for the removal of Zn (II) from aqueous solution.

Results of these investigations led to the following:

- Alhagi residues contain 5% ash, 25% lignin, 37.1 alpha cellulose and 25% hemi-cellulose and 5.9 % extractive material.
- The FT-IR spectra of grafted Alhagi residues shows the appearance of a new absorption peak (sharp peak) at  $2244.25\text{ cm}^{-1}$ , which is attributed to the cyanide (CN) groups.
- The FT-IR spectra of amidoximated poly (MAA/AN)-grafted Alhagi residues shows disappearance of the cyanide peak and appearance of new absorption peak at  $1655.73\text{ cm}^{-1}$  corresponding to the stretching vibration of the C=N bond which indicate the conversion of the original cyanide groups to amidoxime groups.
- The graft yield % increase by increasing radiation dose from 5 to 10 kGy and then remained constant at higher radiation doses (15-20 kGy).
- The graft yield % increase by increasing the comonomer composition up to 60/40 (MAA/AN) and then decreases.
- The appropriate condition for grafting of MAA/AN Alhagi residues could be achieved using radiation dose of 10kGy and MAA/AN ratio of 60-40.

The adsorption data indicate that the amidoximated samples were effectively used in adsorption of Zn (II) rather than Hg (II) and Pb (II) from aqueous solutions.

-The adsorption capacity of Zn (II) onto amidoximated poly (MAA/AN) – grafted Alhagi residues were 212.76 and 344.8 mg/g at 30 and 50°C, respectively.

-The adsorption data obeyed both Langmuir and Freundlich isotherms and followed second order kinetics.