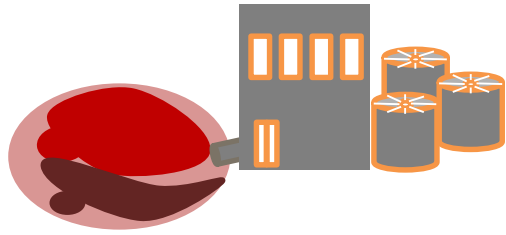


Novel Hybrid Regeneration Process for Adsorbent used in Wastewater Treatment

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Problems



Release of toxic industrial pollutants taints waterbodies

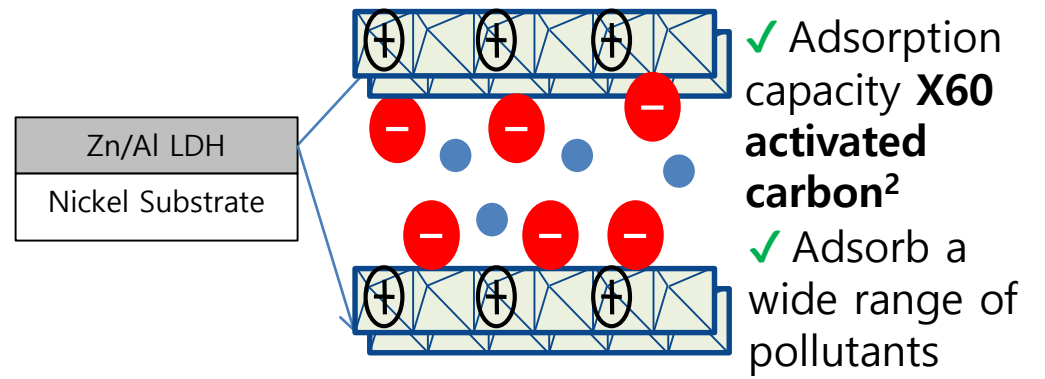
In developing countries, **70% of industrial wastewater is discharged** into waterbodies¹

Adsorption: superior performance in removing chemical contaminants.

- X Little focus on reusing used adsorbents
- X Not economically viable and environmentally-friendly

Proposed Solutions

Layered Double Hydroxide (LDH)



Aim: Develop Regeneration Process of pollutant loaded LDH

Key Findings

Novel Electrochemical (EC) Regeneration

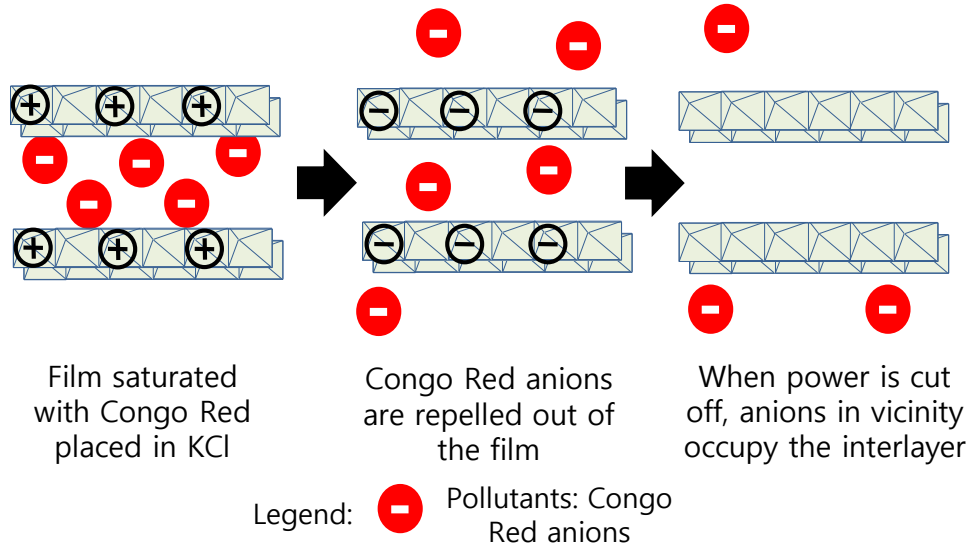


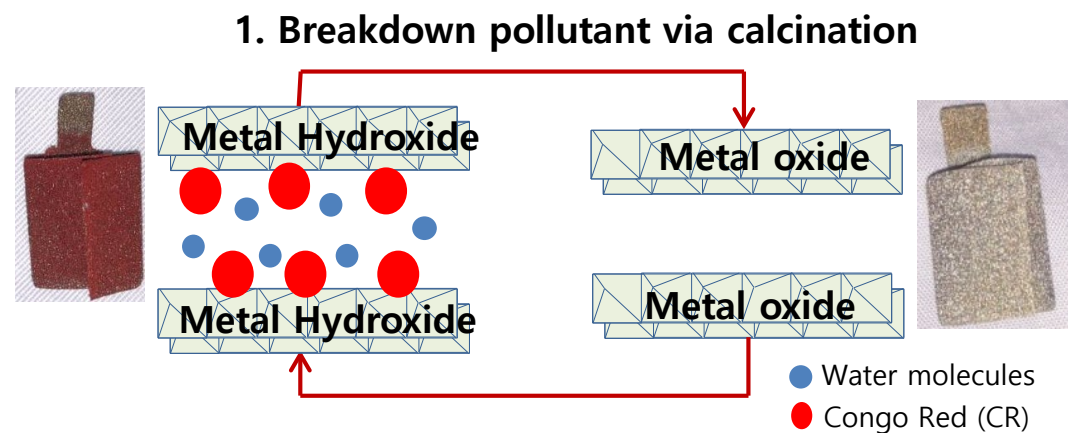
Figure 2. Schematic representation of proposed mechanism

- **Novel idea** of using electrical potential: drive pollutants out of the layered structure
- **185% boost** in recovery rate
- **6 times cheaper** than conventional methods

Novel EC Regeneration

- ✓ On-site Regeneration
- ✓ Recovery of Adsorbate
- ✓ Cost Effective
- ✓ No Sludge Generated

Calcination



2. Regaining adsorption capacity via "Memory Effect"

Activation via calcination: Adsorption capacity of LDH **X60** when activated at 400 °C

Previously reported: ~20% capacity loss after **each** cycle²

➔

This project: **<5% loss in total** (till 6th cycle)

Regeneration via Calcination

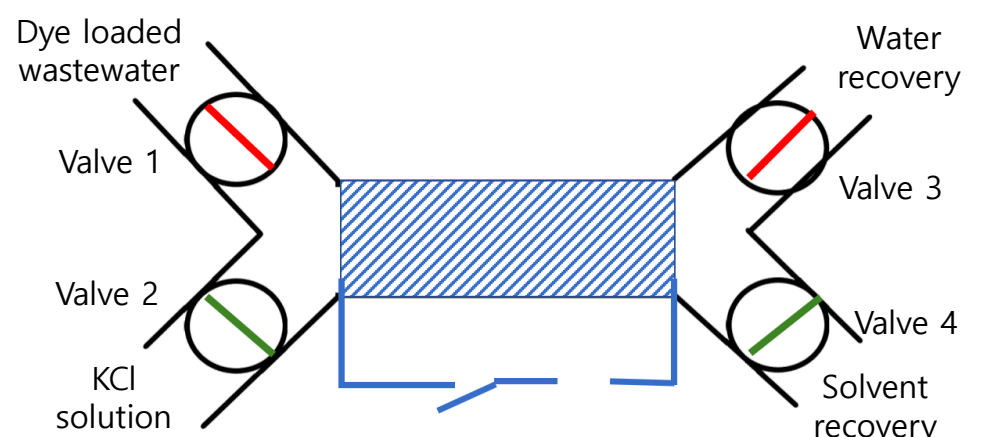
- ✓ **Effective Recovery**
- ✓ Cost Effective
- ✓ Simple process

Conclusions

Novel EC Regeneration	Calcination
185% boost in recovery rate	Reduce capacity loss per cycle by 80%
✓ Low energy consumption	✓ Optimized Process ✓ High recovery
✓ Cost Effective ✓ Simple Process ✓ Environmentally Friendly	

Future Works

Hybrid water treatment



1. Azizullah, A., Khattak, M. N. K., Richter, P., & Häder, D. P. (2011). Water pollution in Pakistan and its impact on public health—a review. *Environment international*, 37(2), 479-497.
 2. Zaghouane-Boudiaf, H., Boutahala, M., & Arab, L. (2012). Removal of methyl orange from aqueous solution by uncalcined and calcined MgNiAl layered double hydroxides (LDHs). *Chemical Engineering Journal*, 187, 142-149.