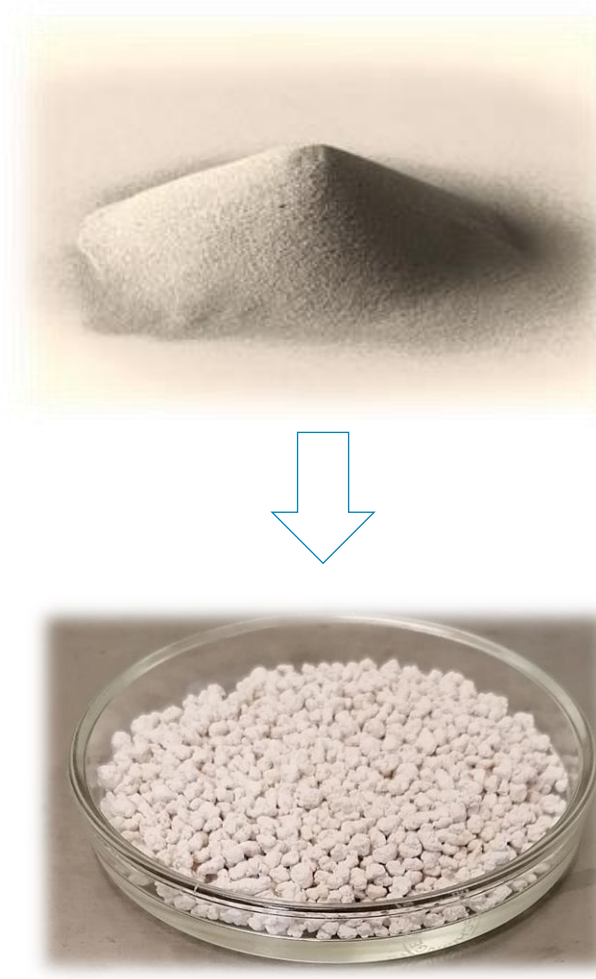


INTRODUCTION

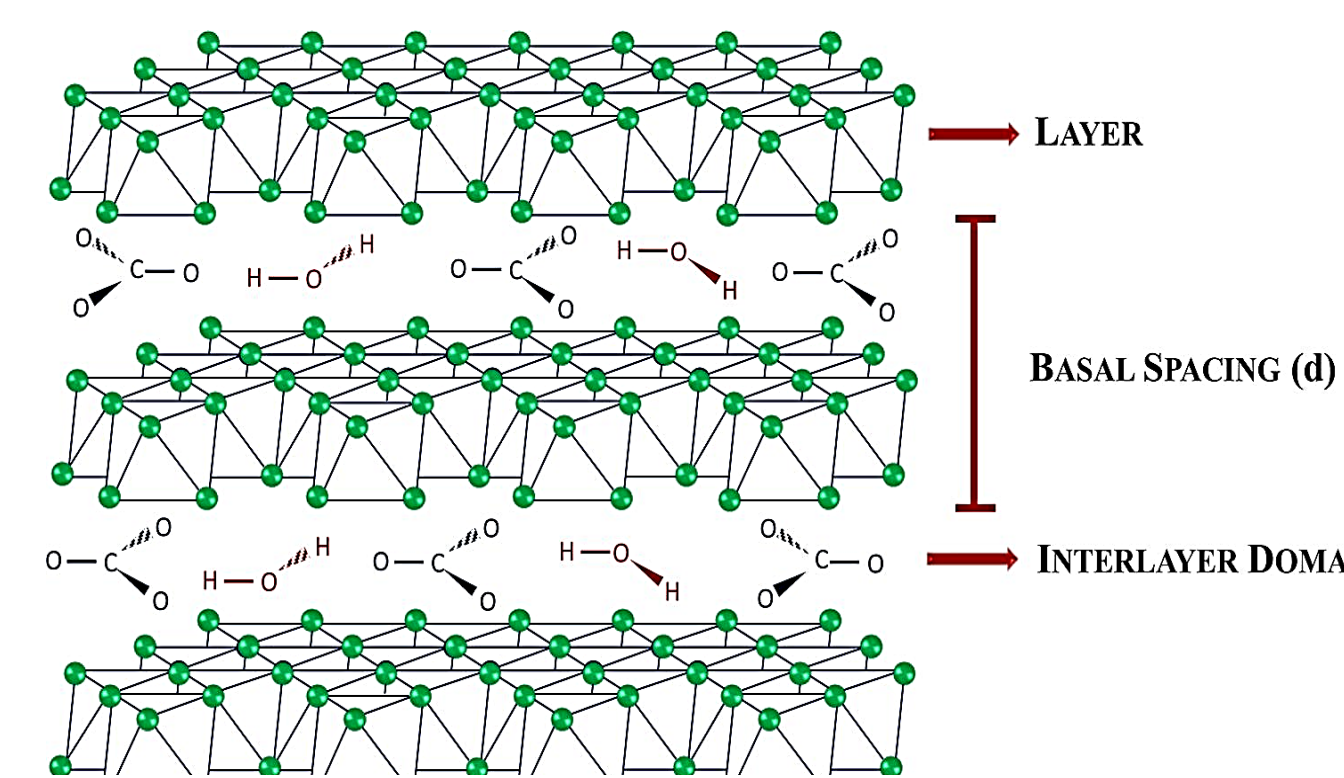
The present study focuses on the application of the granulated clay-based adsorbents for heavy metal uptake (such as Cr) from the Jajmau municipal wastewater treatment plant (STP) as part of the H2020 EU-India PAVITRA GANGA project which focuses on improving existing wastewater treatment systems. Within the project, the composition of the structured clay-based sorbents is adapted to the specific conditions of the Indian test-case, taking into account the chromium speciation (Cr^{3+} and/or Cr^{6+}) relevant concentrations and the competitive ions. The final goal is to ensure that wastewater loaded with Cr can be re-used for irrigation after the treatment.

Structured sorbents of Composites with specific structure:



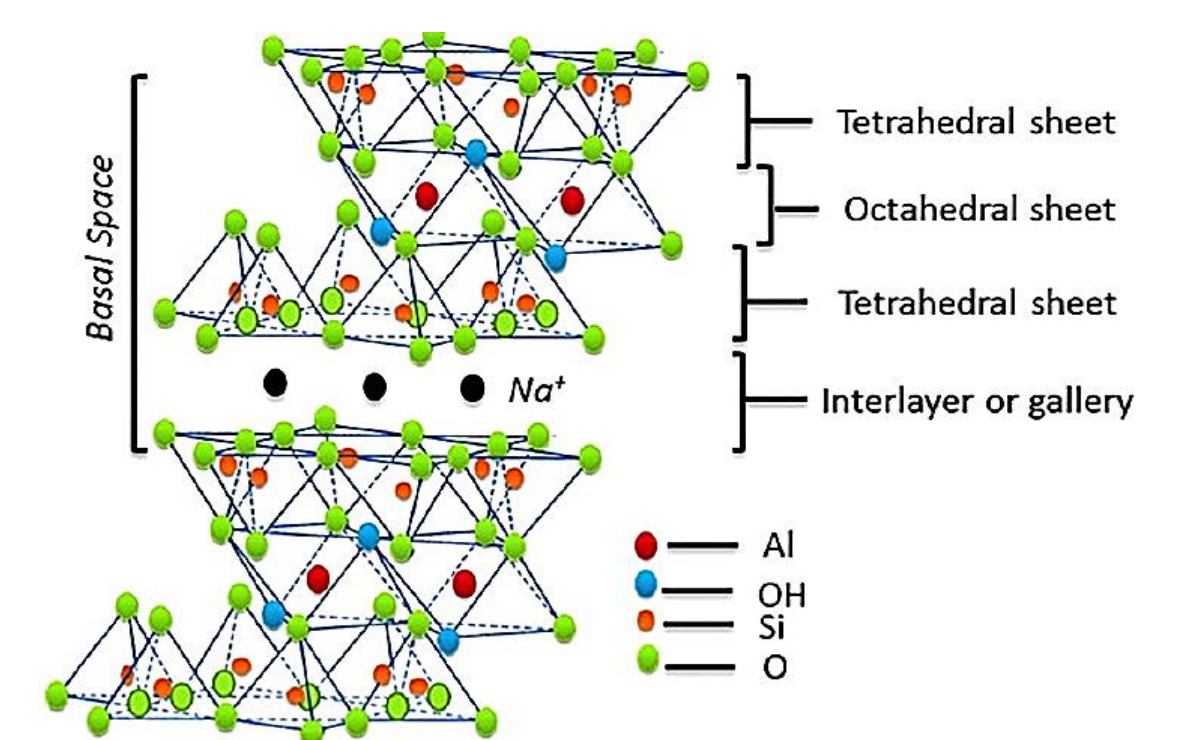
- ✓ Cr^{6+} → LDH type clay
- ✓ Cr^{3+} → Phyllosilicate type clay

Layered Double Hydroxides (LDHs)



- Eco-friendly, highly available, cheap, ...
- Anionic clay, positive layer charge

Layered Phyllosilicates (Bentonite - B)

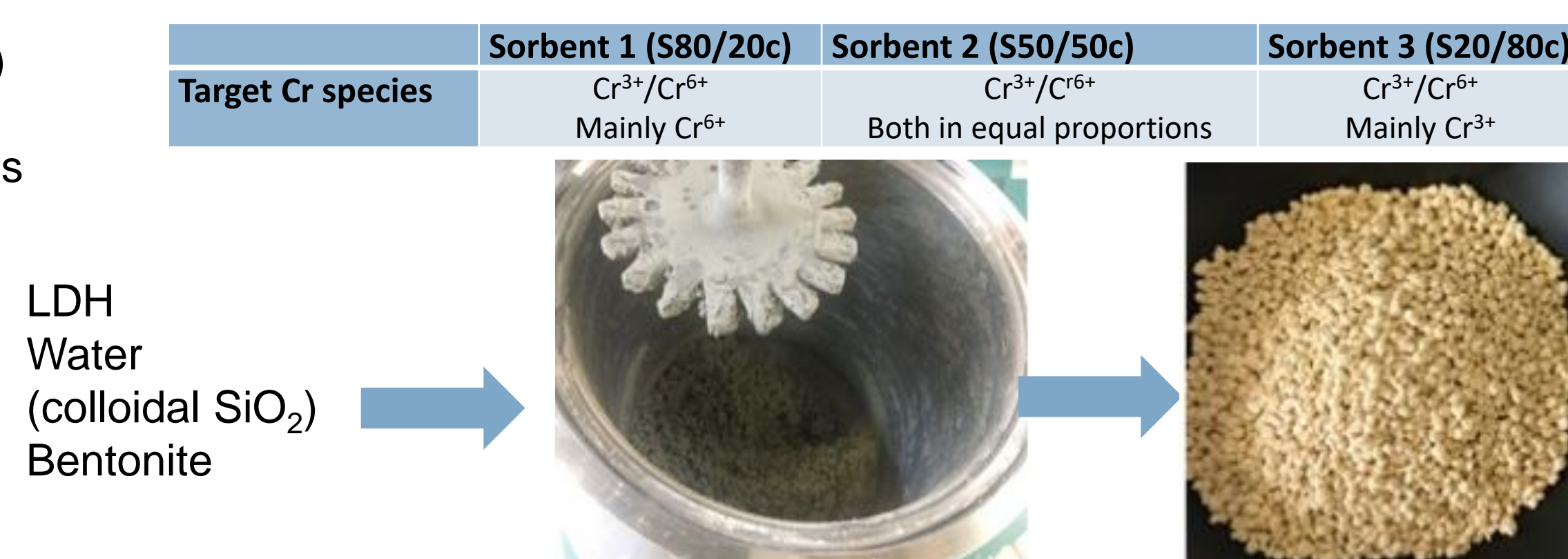


- Cationic clay, negative layer charge

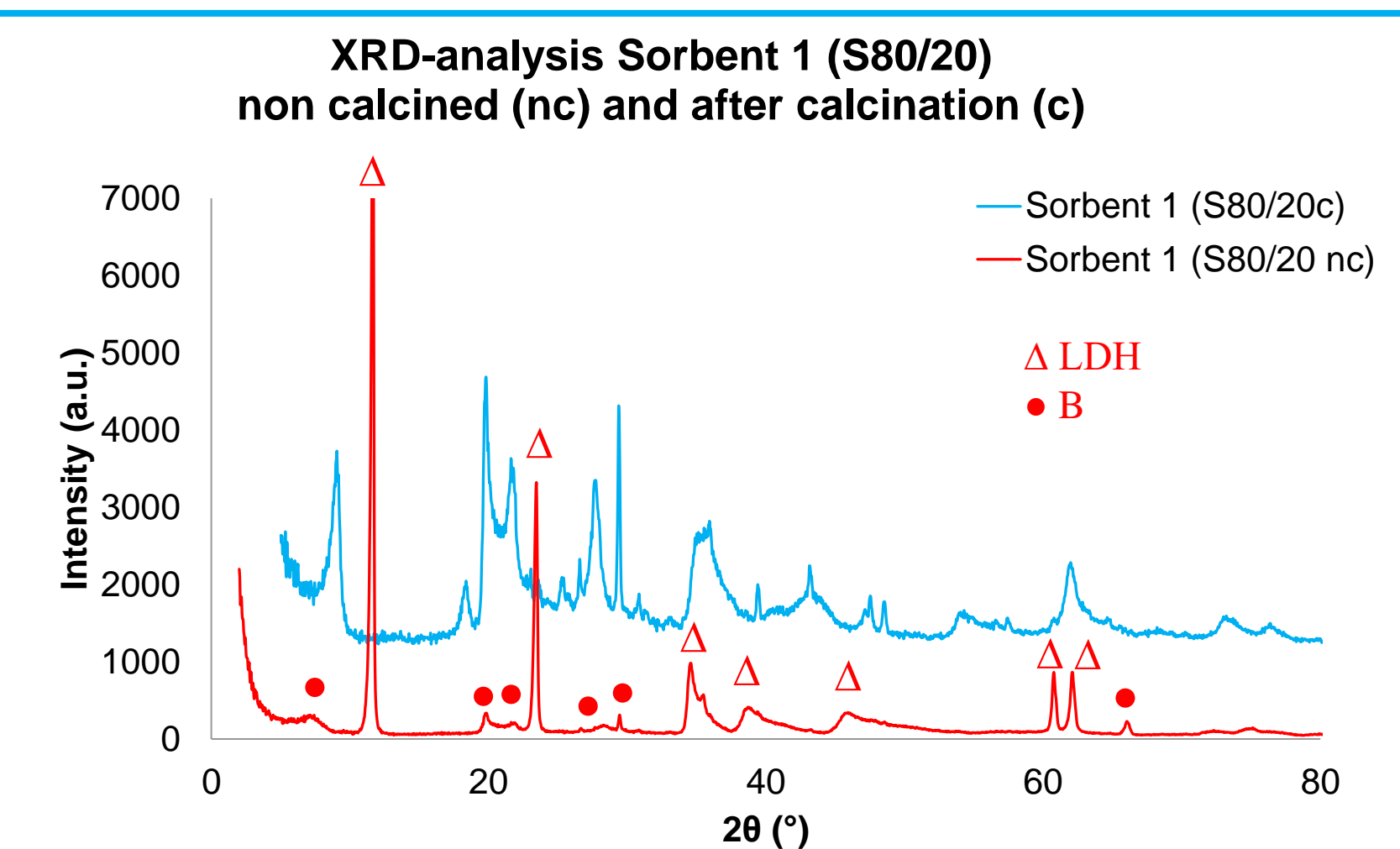
METHODS

Granulated composites prepared by intensive mixing technique:

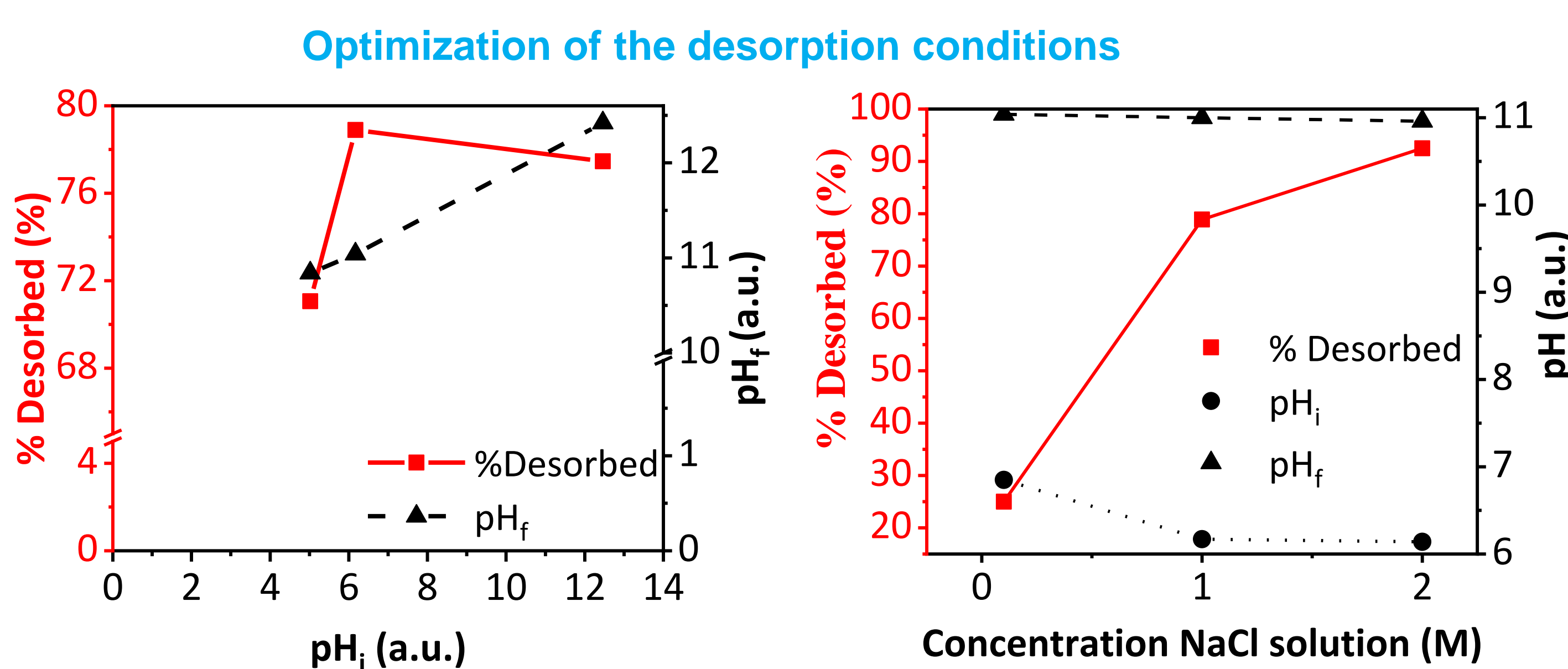
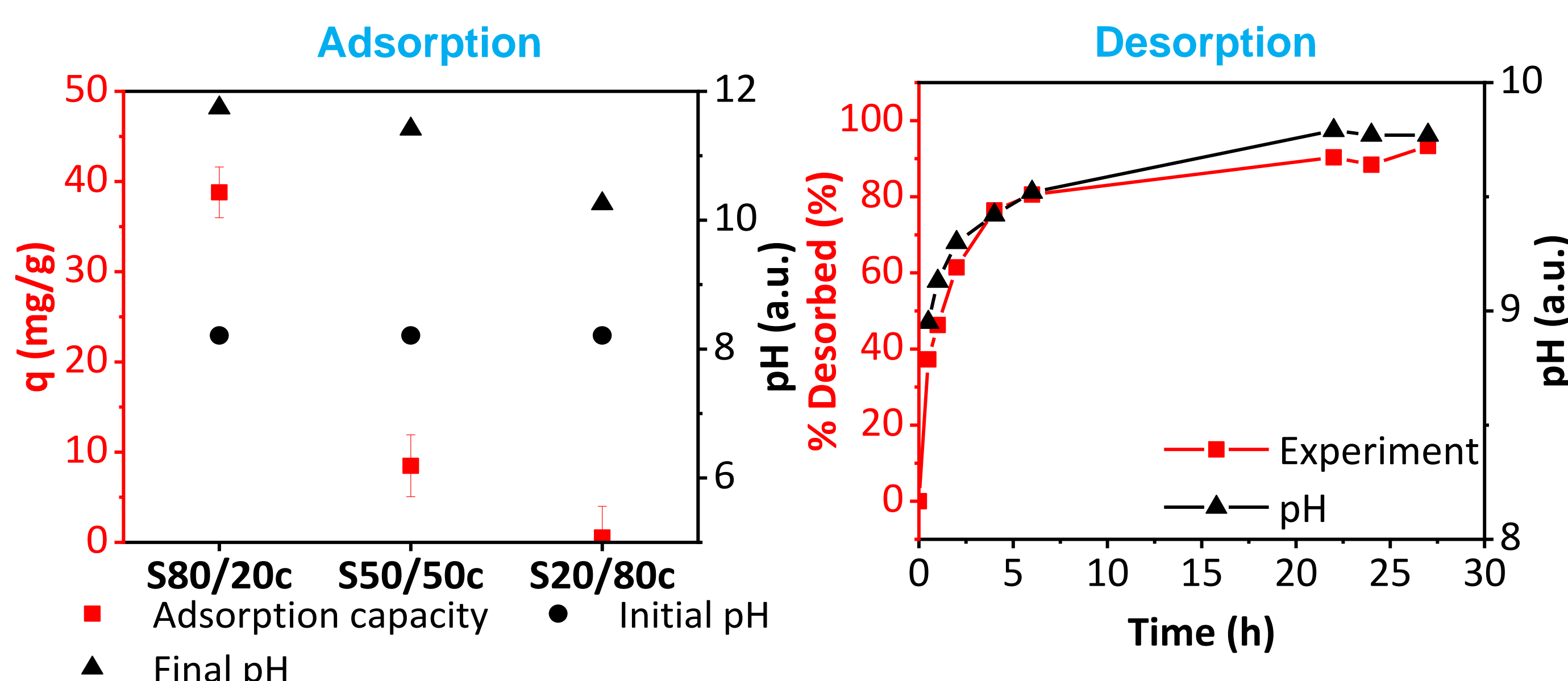
- Different ratios (LDH/B)
- Different porosities
- Different granulate sizes



	Sorbent 1 (S80/20c)	Sorbent 2 (S50/50c)	Sorbent 3 (S20/80c)
Target Cr species	$\text{Cr}^{3+}/\text{Cr}^{6+}$ Mainly Cr^{6+}	$\text{Cr}^{3+}/\text{Cr}^{6+}$ Both in equal proportions	$\text{Cr}^{3+}/\text{Cr}^{6+}$ Mainly Cr^{3+}



RESULTS and DISCUSSIONS



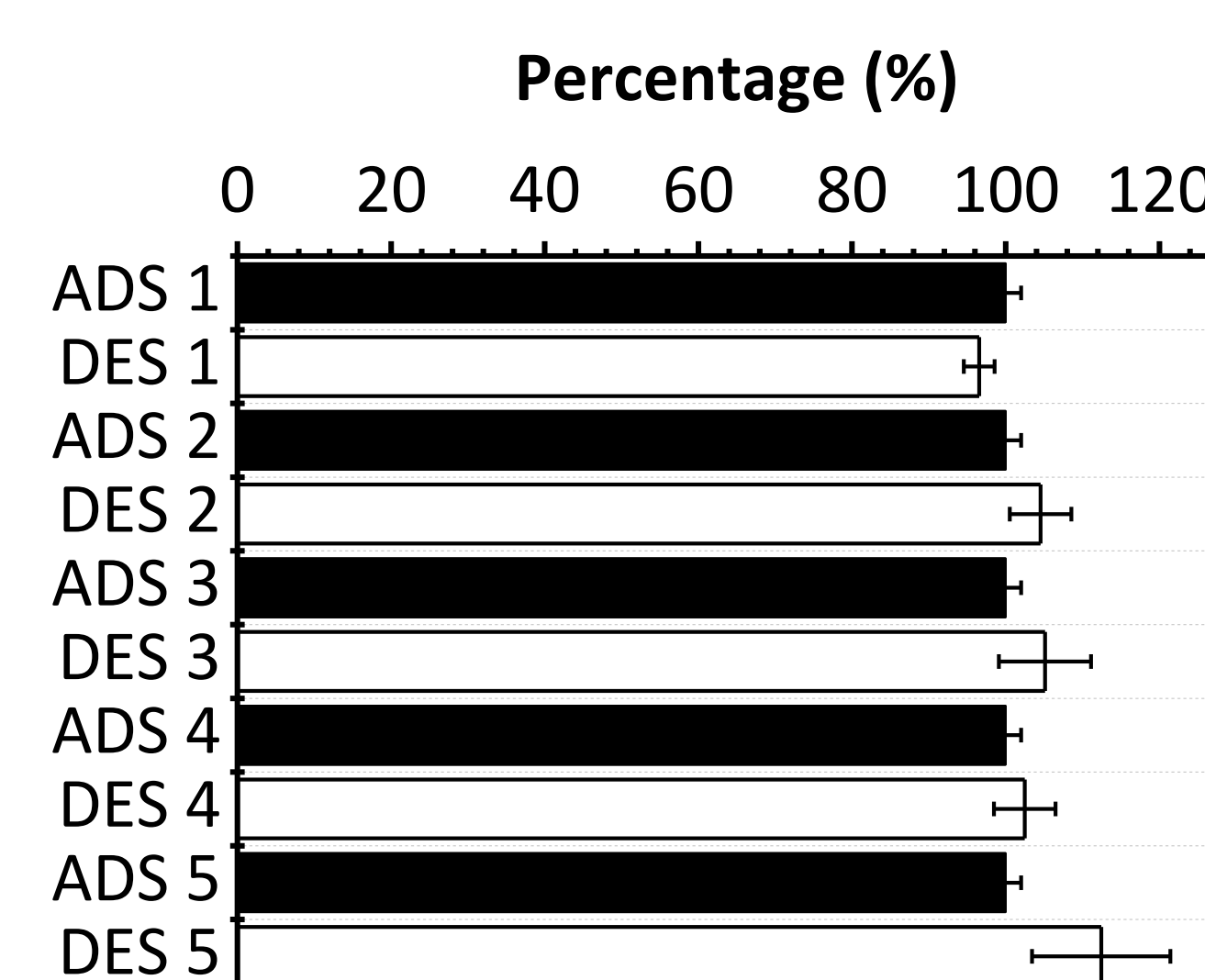
Adsorption

- Best adsorbent: S80/20c

Desorption

- Granulates of 1-2 mm, dried prior to test
- ↑ pH => better desorption due to competition
- ↑ Cl^- concentration => better desorption due to competition
- Kinetic model: pseudo-second order model

Adsorption – desorption cycles



Adsorption – desorption cycles

- Cycles of 24 h
- Granulates of 1-2 mm
- Excellent stability

CONCLUSIONS

- Within the project, the composition of the structured clay-based composite sorbents was adapted to the specific conditions of the Indian test-case, considering the chromium speciation (Cr^{3+} and/or Cr^{6+}).
- Sorption performance with regard of capacity, kinetics, selectivity and desorption procedure were optimized.

Outlook

- Testing environmental samples
- Column-mode experiments

ACKNOWLEDGEMENTS

The authors acknowledge the Horizon 2020 EU-India PAVITRA GANGA project (more information on <https://pavitra-ganga.eu/en>) Grant Agreement n° 821051.



**PAVITRA
GANGA**