HDTMA-modified carbon-zeolite composites as adsorbents of 2,4-D and MCPA pesticides

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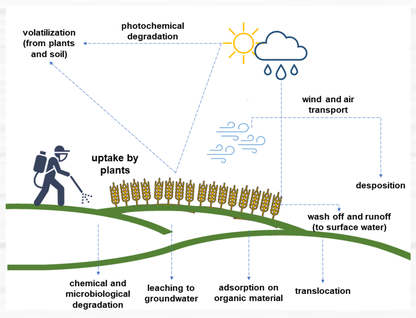
Introduction



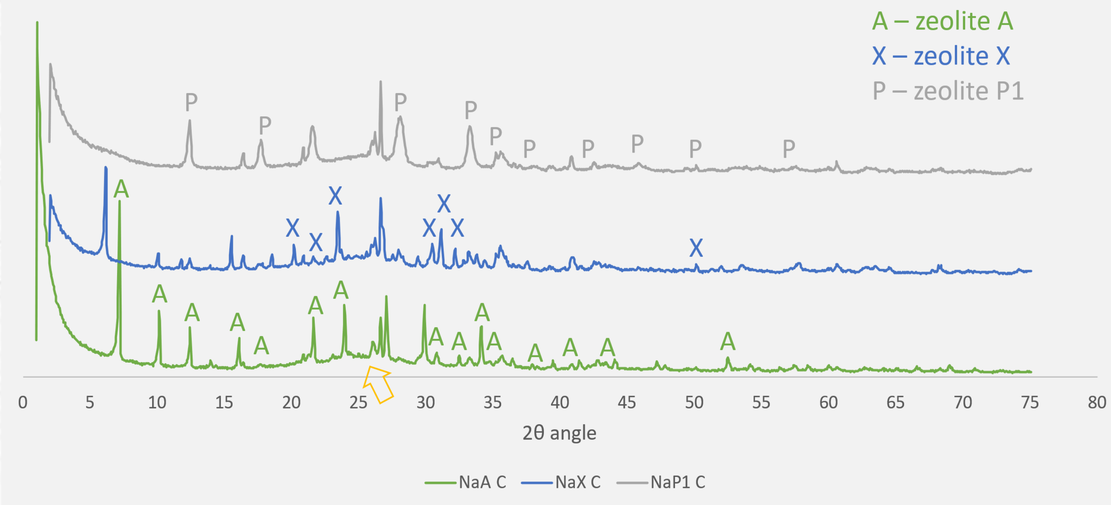
Routes of pesticide spreads in the environment.

Since the latter half of the nineteenth century, extensive agricultural use of plant protection products, commonly referred to as “pesticides," has seriously impacted soil, air, and water. Thus, the removal of pesticides and their derivatives from water is one of the major environmental concerns. In this study three composites of active carbon and zeolites with faujasite (NaX-C), LTA (NaA-C), and gismondite (NaP1-C) structures were investigated as adsorbents of 2,4-D and MCPA pesticides.

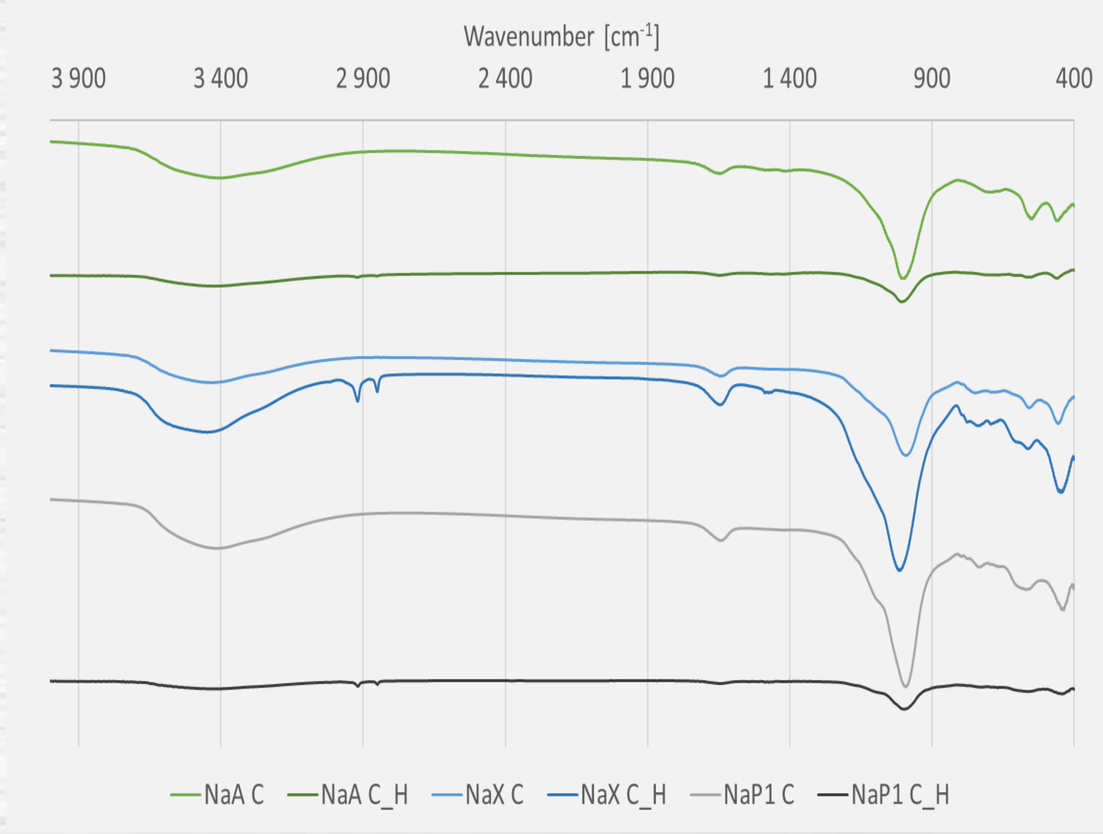
High performacne liquid chromatograpch with diodae array detector.

All composites were further modified with cationic surfactant. The properties of obtained adsorbents were studied by elemental analysis CHNS, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR). The adsorption of 2,4-D and MCPA were tested under static conditions. The concentration of pesticides in the remaining solutions was determined by direct injection to a high-performance liquid chromatograph (HPLC) with a UV-Vis detector.

Results & Discussion



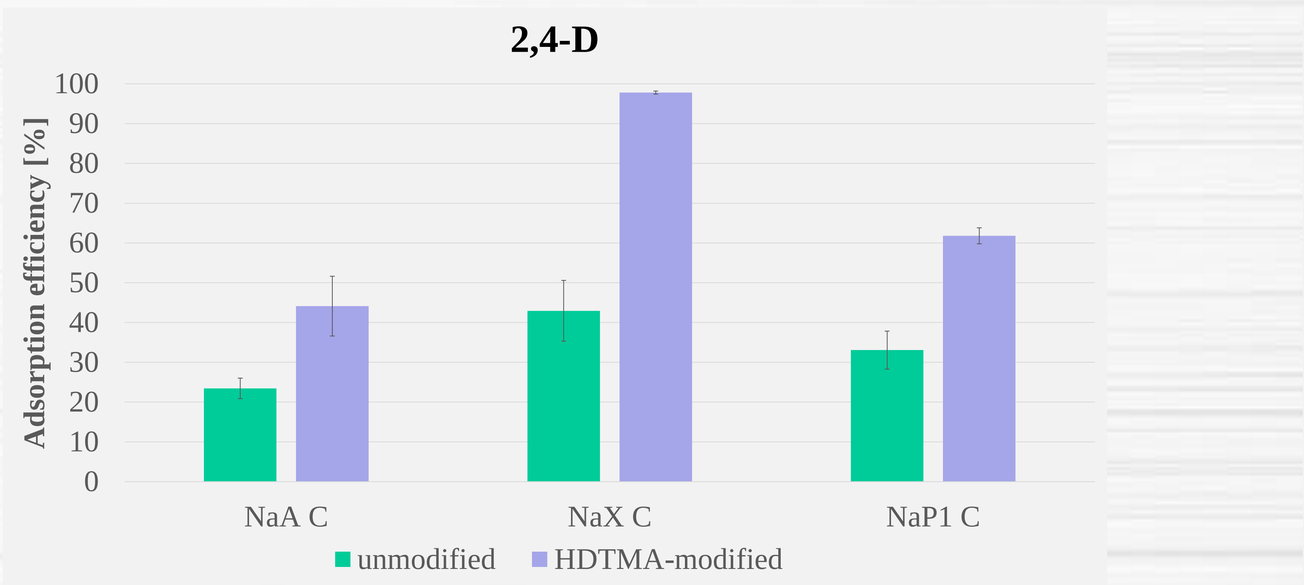
XRD analysis of unmodified zeolite-carbon composites.



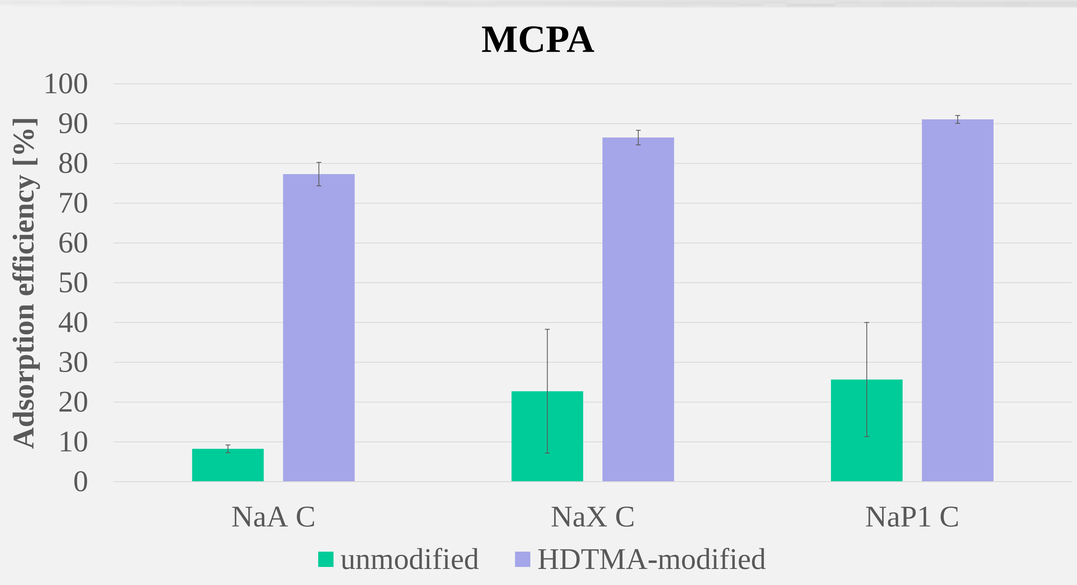
FTIR analysis of unmodified and modified zeolite-carbon composites.

	NaA-C	NaX-C	NaP1-C
ECEC [meq/100 g]	20.2	34.2	49.5
Effectiveness of modification	0.95 ECEC	0.91 ECEC	0.93 ECEC

The results of elemental analysis CHNS of zeolite-carbon composites.



Adsorption of 2,4-D onto unmodified and HDTMA-modified zeolite-carbon composites.



Adsorption of MCPA onto unmodified and HDTMA-modified zeolite-carbon composites.

Conclusions

The zeolite carbon composites NaX-C, NaA-C, and NaP1-C are characterized by good sorption abilities towards 2,4-D and MCPA. Modification of the surface of composites with HDTMA enhances their adsorption properties. Moreover, adsorption efficiency depends on the type of pesticide, which suggests that the structure of molecules plays an important role in mechanisms of removal.

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