Leibniz-Institut für Polymerforschung Dresden

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Layered Double Hydroxides (LDH): A Multifunctional Versatile System for Material Development

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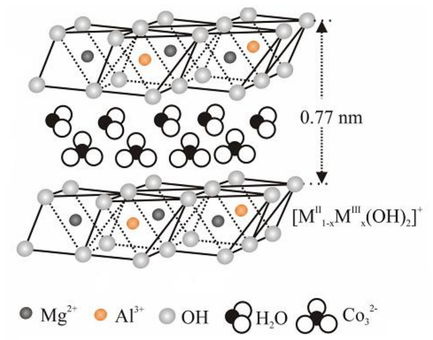
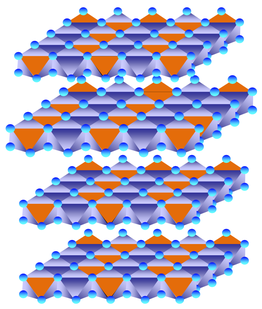
Introduction

LDHs – known as hydrotalcite-like materials – are anionic clays with the formula of $[M^{II}_{1-x}M^{III}_{x}(OH)_2]^{x+}A^{n-}_{x/n} * y\ H_2O$
where M^{II+} , M^{III+} and A^{n-} are divalent metal cations, trivalent metal cations and interlayer anions respectively.
LDH are investigated as antioxidants, stabilizers and flame retardants for polymers, but there are also special application in biomedical field and energy sectors. The tunable properties make them a multifunctional material.



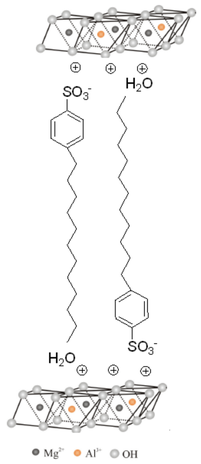
Basic Structure of LDH with exchangable anions



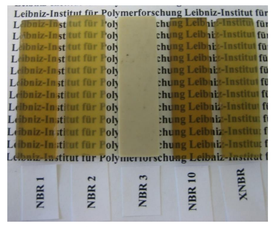
LDH with tunable properties by using transition metals

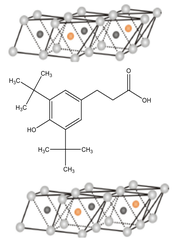
Possible protection of polymers by both, modification of interlayer and tuning of layer forming metal cations

Polymer Nanocomposites

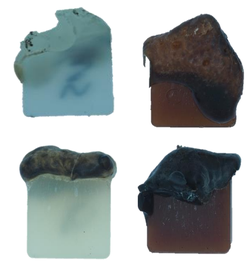


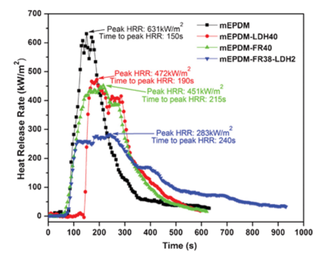
Organic Modification for best exfoliation necessary



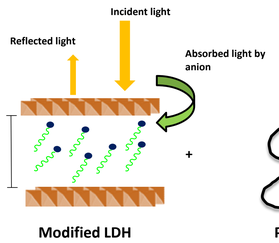


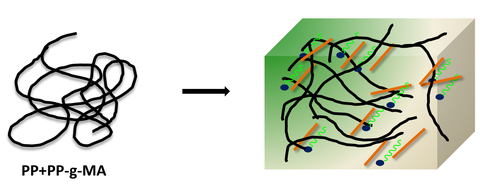
Radical Scavengers





Effect in Flame Retardancy



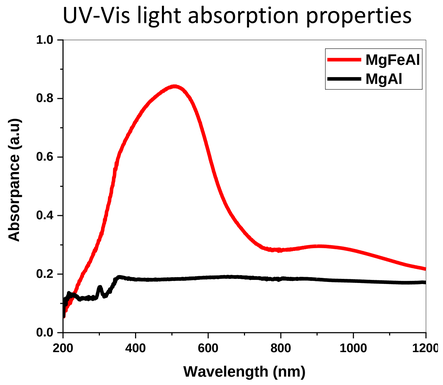


Schematic presentation of polymer nanocomposite preparation and interaction with light

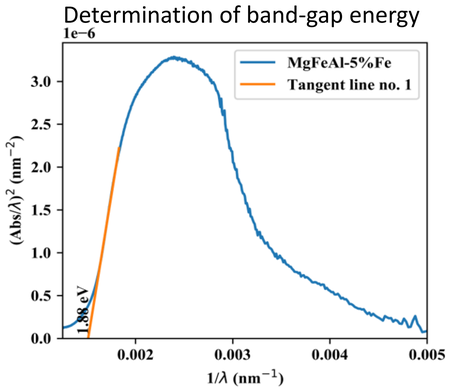
Energy Applications

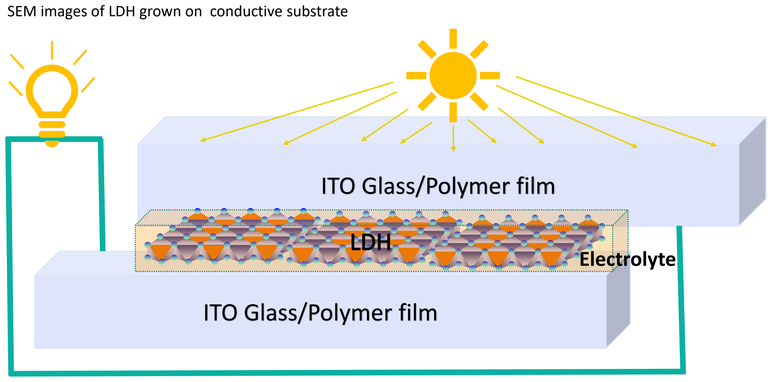
SEM images of LDH grown on conductive substrate

UV-Vis light absorption properties

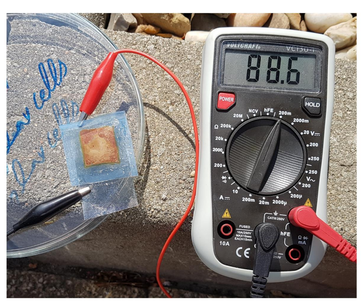


Determination of band-gap energy



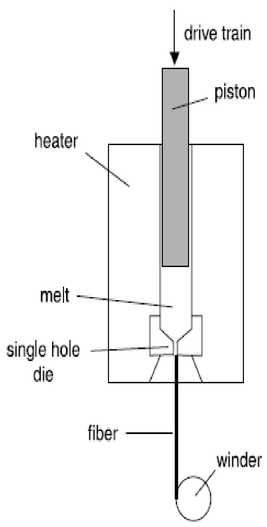


Concept of simple solar cell based on LDH placed on conductive substrate



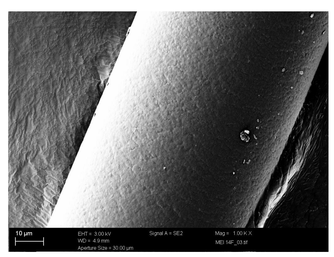
Demonstration of cell activity

Biomedical Applications

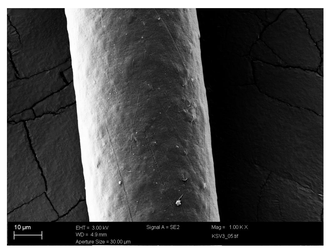


Piston type spinning device

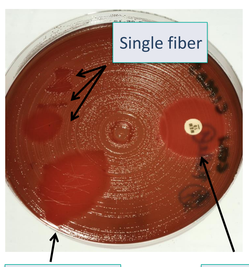
HDPE melt-spun fiber



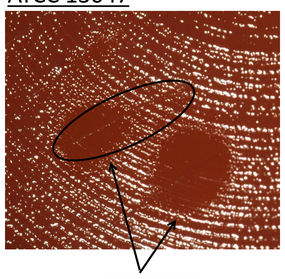
mLDH/HDPE melt-spun nanocomposite fiber containing ciprofloxacin in the LDH



Escherichia Coli ATCC 25922



Enterobacter Cloacae ATCC 13047



Flame Retardant | **Catalyst** | **Biomedical Use** | **UV-Light Absorber** | **Energy Application** | **Solar Cell** | **Hydrogen Generation**