



## Mössbauer spectroscopic investigations on iron oxides and modified nanostructures: A review

**Boris Wareppam, Ernő Kuzmann, Vijayendra K. Garg, L. Herojit Singh**

Mössbauer spectroscopy offers an effective and efficient characterization technique to investigate the local structure of Mössbauer-active elements such as iron, gold, and tin. The authors review local structure transformation on the optimization of magnetite with iron hydroxides, spin dynamics of bare, capped, core-shell and composites of iron oxide nanoparticles (IONPs), dipole-dipole interactions and diffusion of IONPs based on findings using Mössbauer spectroscopy. <https://doi.org/10.1557/s43578-022-00665-4>

## Insight into photocatalytic behavior of magnesium ferrite-bentonite nanocomposite for the degradation of organic contaminants

**Manpreet Kaur Ubhi, Manpreet Kaur, Jaspreet Kaur Grewal, Aderbal C. Oliveira, Vijayendra Kumar Garg, Virender K. Sharma**

The authors studied the  $MgFe_2O_4$ -bentonite nanocomposite for the photodegradation of malathion and *p*-nitrophenol as model pollutants. Interactions between  $MgFe_2O_4$  and bentonite were studied employing x-ray photoelectron spectroscopy, Mössbauer, and bandgap potential studies. Mössbauer studies revealed increased absorption area, signifying hindrance in the growth of  $MgFe_2O_4$  in the presence of bentonite. The nanocomposite displayed synergistic removal of metal ions and photodegradation of organic contaminants, making it a potential candidate for remediation of inorganic and organic contaminants. <https://doi.org/10.1557/s43578-022-00674-3>

## Iron nanoparticles for plant nutrition: Synthesis, transformation, and utilization by the roots of *Cucumis sativus*

**Maria Gracheva, Zoltán Klencsár, Viktória Kovács Kis, Kende Attila Béres, Zoltán May, Viktória Halasy, Amarjeet Singh, Ferenc Fodor, Ádám Solti, László Ferenc Kiss, Gyula Tolnai, Zoltán Homonnay, Krisztina Kovács**

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The authors propose ferrihydrite nanoparticles that model the available iron pool of soils to recover iron deficiency of plants. Several nanocolloid suspensions differing in the surfactant type were prepared for plant treatment and fully characterized by transmission electron microscopy and  $^{57}Fe$  Mössbauer spectroscopy. Nanomaterials at different stages of transformation were the subject of plant physiological experiments aimed at comparing behavior and plant accessibility of manufactured suspensions of nanoscale iron(III) oxide and oxide-hydroxide particles. <https://doi.org/10.1557/s43578-022-00686-z>



## Die-embedded glass packaging for 6G wireless applications

**Xiaofan Jia, Xingchen Li, Kyoung-Sik Moon, Madhavan Swaminathan**

The authors present an antenna-integrated glass package with embedded die for 110–170 GHz wireless applications. The new package uses glass as the core material, in which dies are embedded. The redistribution layer for electrical connections is fabricated on low-loss polymeric build-up films and it also includes a patch antenna array. The vertical interconnects between the dies and the package are implemented using laser-drilled micro-vias. <https://doi.org/10.1557/s43580-022-00335-x>

## Structure and properties of electro spray printed polymeric films

**Emma E. Pawliczak, Bryce J. Kingsley, Paul R. Chiarot**

Electrospray printing is a low-cost additive manufacturing technique using high-electric potential to generate a spray of charged, solvent encapsulated solute particles. This enables coating to wrap around complex geometries to deliver material to non-line-of-sight surfaces. The authors report on the printing of polyimide films onto flat silicon wafers and industry-standard bond wires and pads. The printed coatings exhibited good dielectric strength, increased hydrophobicity, and corrosion resistance improvement up to four times. <https://doi.org/10.1557/s43580-022-00340-0>

## Graphitic surface layer formation on organic substrates for electronics using a concentrated solar simulator

**Mostafa Abuseada, Abdalla Alghfeli, Timothy S. Fisher**

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Heat spreading is an important attribute that improves thermal management and operation of high-performance packages, such as those for solid-state power amplifiers. This attribute can be enhanced through direct transformation of polymers into graphitic films. The authors present a custom vacuum deposition process that synthesizes thin graphitic layers on organic substrates through direct pyrolysis via concentrated irradiation from a xenon lamp—a light source, replaceable with concentrated terrestrial solar power. <https://doi.org/10.1557/s43580-022-00339-7>