Two publications about the multicenter bond formalism in a wide range of molecules and inorganic compounds

Electron-deficient multicenter bonding in pnictogens and chalcogens: mechanism of formation†

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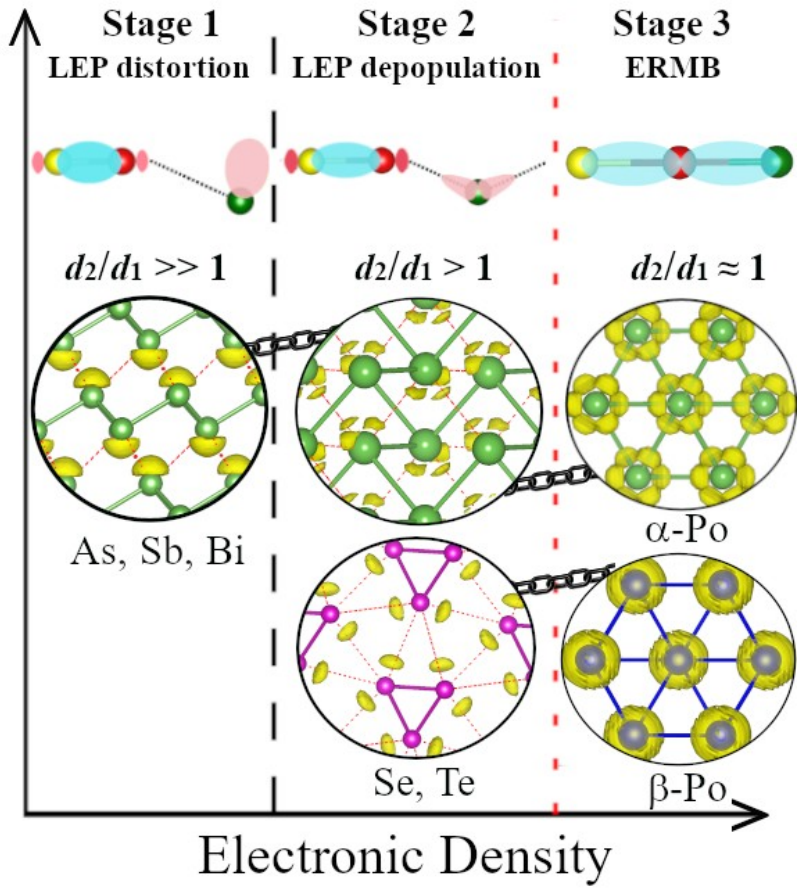

J. Mater. Chem. C, 2024,**12**, 10447-10474

A unified theory of electron-rich and electron-deficient multicenter bonds in molecules and solids: a change of paradigms

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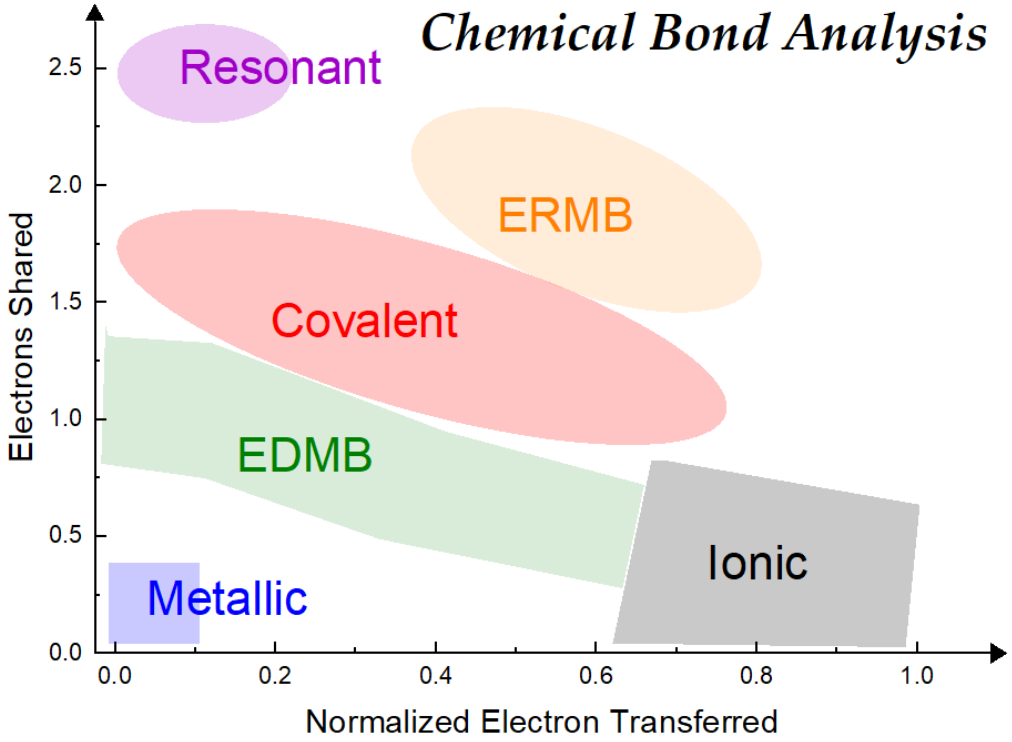

J. Mater. Chem. C, 2025,**13**, 3774-3803

A unified theory of electron-rich and electron-deficient multicenter bonds in molecules and solids: a change of paradigms

•Hussien H. Osman,*[abc] P. Rodríguez-Hernández,[d] Alfonso Muñoz [d] and Francisco J. Manjón *[a]

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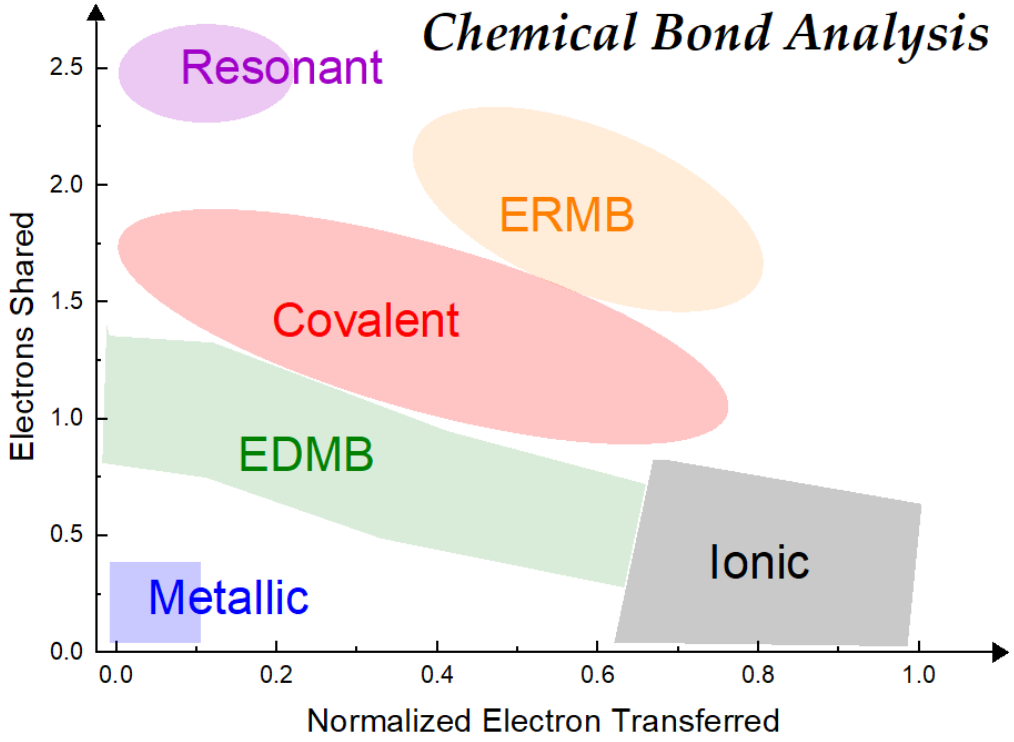


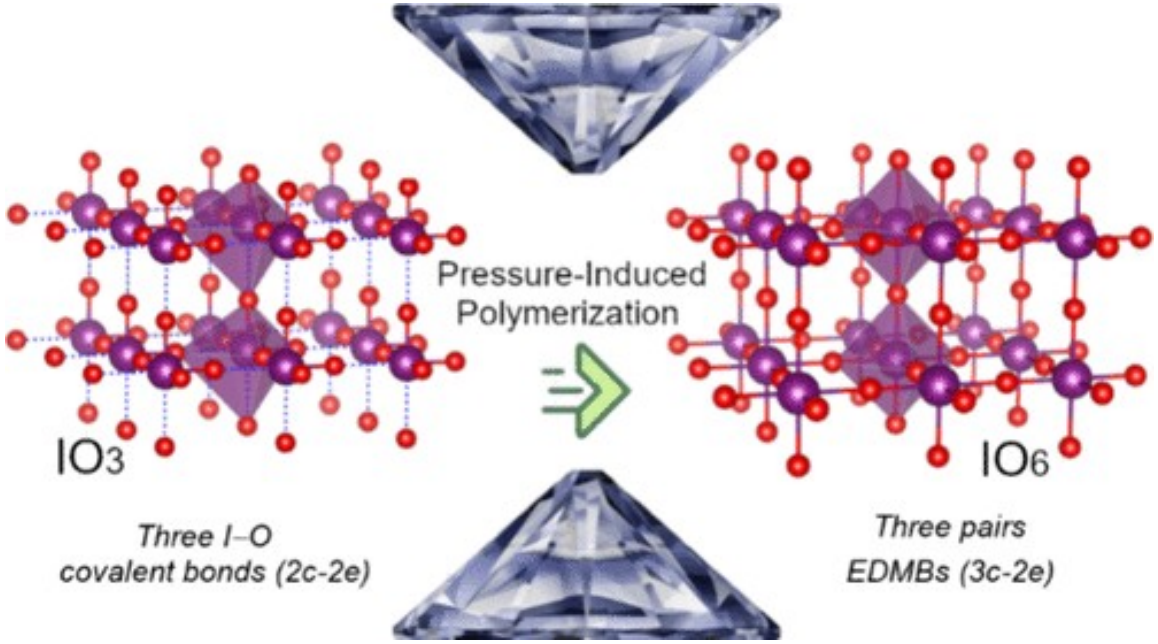
J. Mater. Chem. C, 2025,**13**, 3774-3803

After publishing the theory or the basics of the new formalism of the multicenter bond, a couple of articles have been published to justify the existence of electron-deficient and electron-rich multicenter bonds in other materials

Unconventional Electron-Deficient Multicenter Bonds in AlO_3 Perovskites

Hussien H. Osman, José Luis Rodrigo-Ramón, Shafi Ullah, Enrico Bandiello, Daniel Errandonea, Óscar Gomis, Tania García-Sánchez, Pablo Botella, Robert Oliva, Plácida Rodríguez-Hernández, Alfonso Muñoz, Catalin Popescu, Frederico G. Alabarse, Francisco Javier Manjón*

Chem. Mater. 2025, 37, 11, 4187–4202



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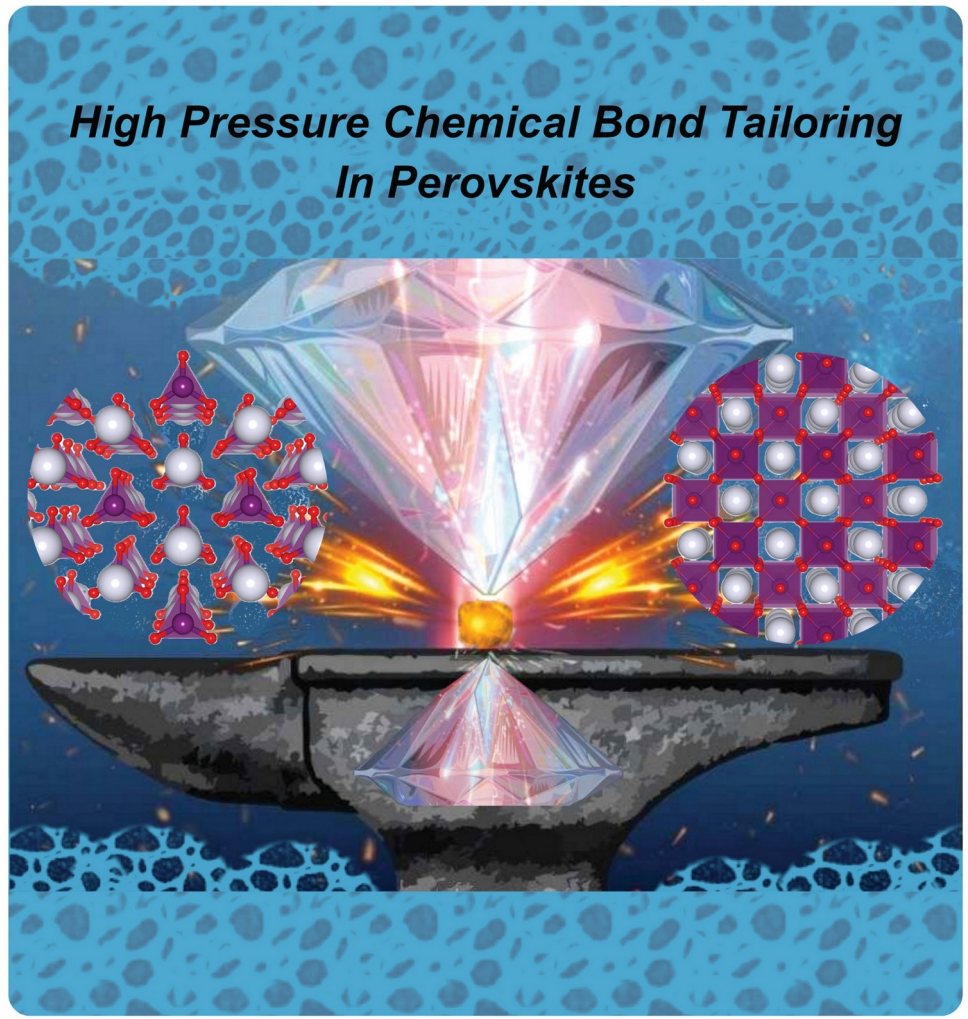

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Chemical bonding in dense $A^{IV}X^{VI}$ and $A^{V}_{2}X^{VI}_{3}$ chalcogenides: electron-deficient multicenter bonds in electron-rich elements

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J. Mater. Chem. C, 2025, Advance Article

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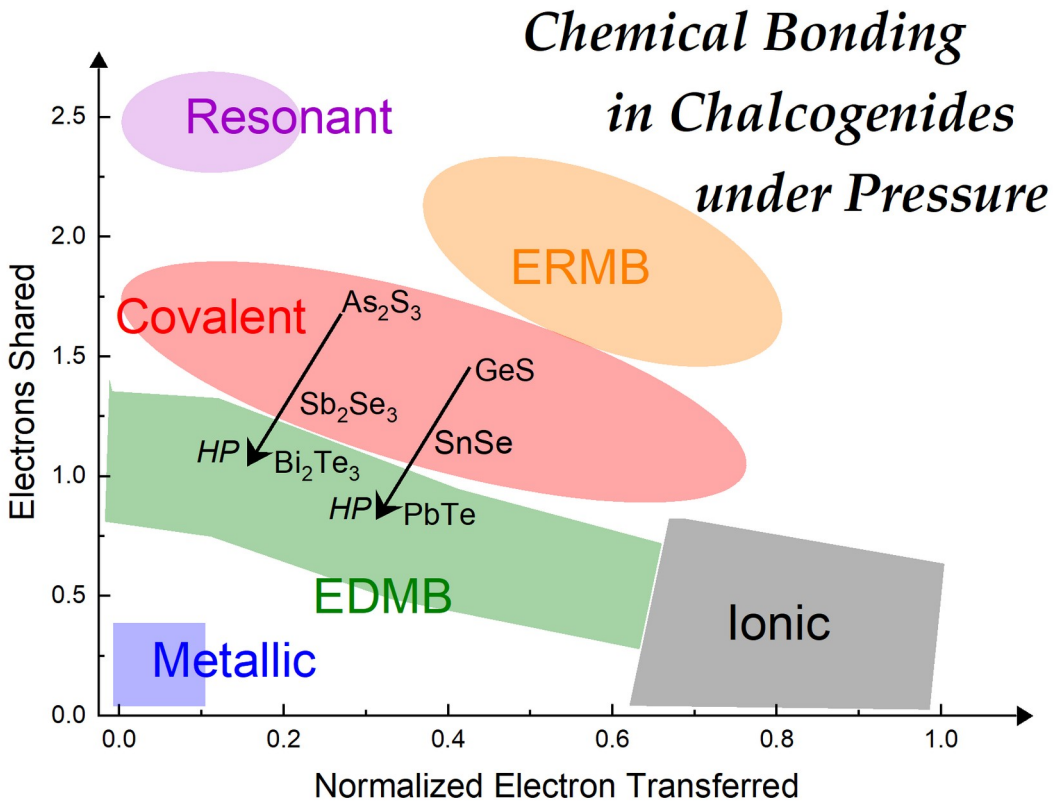

Rethinking polyiodides: the role of electron-deficient multicenter bonds

Matteo Savastano, *[a] Hussien H. Osman, [bcd] Ángel Vegas [e] and Francisco Javier Manjón*[b]

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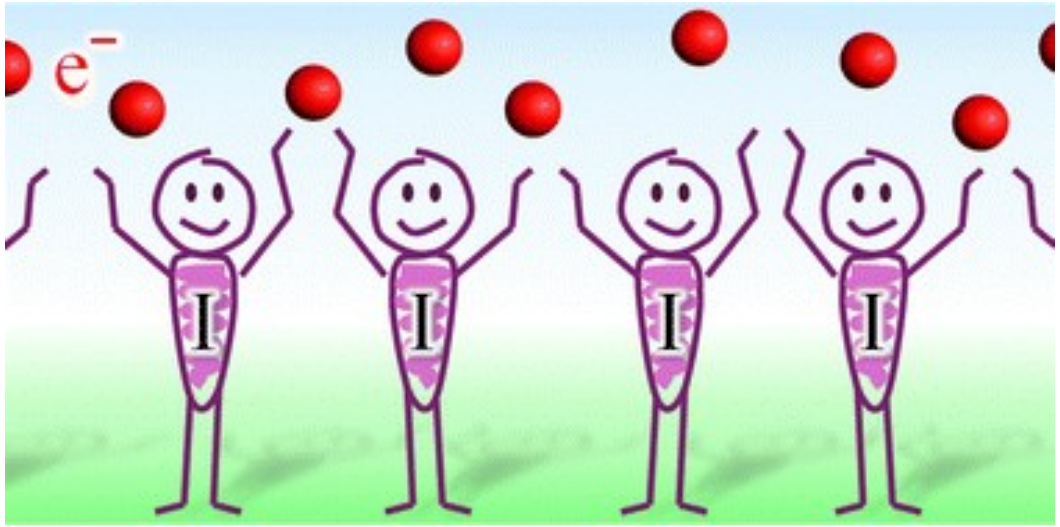
Chem. Commun., 2024,**60**, 12677-12689



Electron-Deficient Multicenter Bonding in Phase Change Materials: A Chance for Reconciliation

Manjón, F.J.; Osman, H.H.; Savastano, M.; Vegas, Á.

Materials **2024**, *17*, 2840.
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Pressure-induced hypercoordination of iodine and dimerization of I_2O_6H in strontium di-iodate hydrogen-iodate ($Sr(IO_3)_2HIO_3$)

D. Errandonea,[a] H.H.H. Osman,[a,b] R. Turnbull,[a] D. Diaz-Anichtchenko,[a] A. Liang,[c] J. Sanchez-Martin,[a] C. Popescu,[d] D. Jiang,[e] H. Song,[e] Y. Wang[e] and F.J. Manjón[b]

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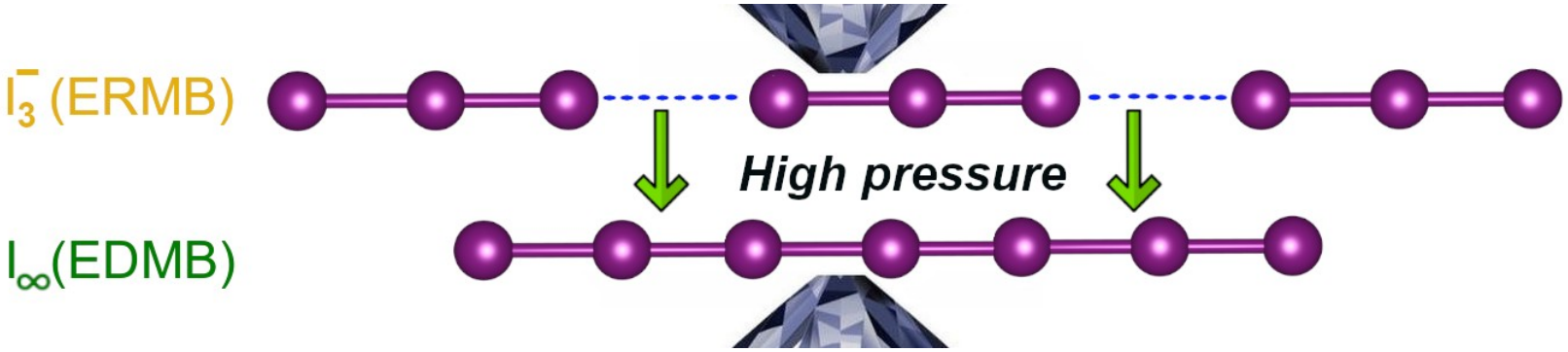
Materials Today Advances, 2024, 22, 100495

From Polyanions to Infinite Chains: Chemical Bonding Evolution in AX3 Polyhalides under Pressure

Enrico Bandiello, Álvaro Lobato, Fernando Izquierdo, Hussien Helmy Osman, Alfonso Muñoz, Plácida Rodríguez-Hernández, Francisco Javier Manjón

J. Mater. Chem. C, 2025 (submitted)



Structures of phosphonitrides in light of the extended Zintl–Klemm concept

Angel Vegas,[a*] **Hussien H. Osman,**[b,c,d] **Alfonso Muñoz,**[e] **Vladislav A. Blatov**[f] **and Francisco Javier Manjón**[b*]

Acta Crystallographica Section B, 2025, 81(4) Pages 378-394

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The extended Zintl–Klemm concept (EZKC) is applied to explain the crystalline structures of phosphonitrides (also known as nitridophosphates in the chemical literature). The examples of $(AE)_2AlP_8N_{15}(NH)$ (AE = Ca, Sr, Ba), $Ge^{IV}PN_3$ and MP_2N_4 (M = Be, Ca, Sr, Ba, Ge^{II}) are mainly discussed, although the examples of LiGaGe and $LiGaGeO_4$ have been also commented on due to their relation with BeP_2N_4. It is shown that the EZKC provides a better understanding of the structures of these compounds than in previous descriptions. In most of these nitrides, P atoms behave as pseudo-Si atoms and N atoms behave as pseudo-O atoms, so providing a good explanation for the four-connectivity of P atoms forming PN_4 units, which behave as pseudo-SiO_4 units like the SiO_4 units in many polymorphs of SiO_2. In addition, the EZKC shows that the notation of these compounds as phosphonitrides is more appropriate than as nitridophosphates because N atoms act as the anions in these compounds.