# Article information:

Quantum octets in high mobility pentagonal two-dimensional PdSe2 | Nature Communications
<https://www.nature.com/articles/s41467-024-44972-2>

# Article summary:

1. PdSe2, a pentagonal 2D material, exhibits unique properties such as air stability, tunable band gap, ambipolar transport, and superconductivity under high pressure.

2. Transport studies of atomically thin PdSe2 field-effect transistors show high saturation current, stability in ambient conditions for over a month, and ultra-high field-effect mobility enabling the observation of Shubnikov-de Hass oscillation and the quantum hall effect.

3. Fabrication of air-stable, high-performance field effect transistor devices using hexagonal BN layers to protect PdSe2 sheets and achieve high resistance and low mobility in the p-doped regime.

# Article rating:

May be slightly imbalanced: The article presents the information in a generally reliable way, but there are minor points of consideration that could be explored further or claims that are not fully backed by appropriate evidence. Some perspectives may also be omitted, and you are encouraged to use the research topics section to explore the topic further.

# Article analysis:

The article titled "Quantum octets in high mobility pentagonal two-dimensional PdSe2" published in Nature Communications discusses the unique properties of PdSe2, a 2D material with a puckered pentagonal lattice structure. The article highlights the potential applications of PdSe2 in digital electronics, thermoelectric, and optoelectronic devices due to its air stability, tunable band gap, ambipolar transport, superconductivity under high pressure, and superior optical and thermoelectric properties.

However, there are several points in the article that raise concerns regarding bias and unsupported claims. Firstly, the article mentions that bulk PdSe2 displays air stability without providing concrete evidence or references to support this claim. Additionally, the article states that mobilities of up to 200 cm2/Vs have been reported for PdSe2 but fails to mention the specific studies or experiments that have demonstrated these results.

Furthermore, the article discusses the fabrication of field-effect transistors using atomically thin PdSe2 layers and graphene electrodes. While the results show high saturation current and field-effect mobility in these devices, there is no mention of potential limitations or challenges faced during device fabrication or characterization. This lack of discussion on experimental difficulties or failures may indicate a bias towards presenting only positive outcomes.

Moreover, the article describes the observation of Shubnikov-de Hass oscillation and quantum hall effect in PdSe2 due to its unique band structure and spin-valley interplay. However, there is limited exploration of possible counterarguments or alternative explanations for these phenomena. Additionally, the article does not address any potential risks associated with using PdSe2 in electronic devices or highlight any drawbacks or limitations of this material.

Overall, while the article provides valuable insights into the properties and potential applications of PdSe2 as a 2D material, it lacks thorough analysis and discussion on certain aspects such as experimental challenges, conflicting evidence, risks involved, and alternative interpretations. This one-sided reporting may lead to an incomplete understanding of the material's capabilities and limitations.

# Topics for further research:

* Limitations of PdSe2 in electronic devices
* Conflicting evidence on air stability of bulk PdSe2
* Challenges in fabricating field-effect transistors with PdSe2
* Risks associated with using PdSe2 in optoelectronic devices
* Alternative explanations for Shubnikov-de Hass oscillation in PdSe2
* Drawbacks of PdSe2 as a material for thermoelectric applications

# Report location:

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