# Article information:

Entropy engineering promotes thermoelectric performance in p-type chalcogenides | Nature Communications  
<https://www.nature.com/articles/s41467-021-23569-z>

# Article summary:

1. Thermoelectric technologies can generate electricity from waste heat, but their high cost and low conversion efficiency weaken their competitiveness.

2. Entropy engineering has been used as a novel strategy to optimize the electrical and thermal transport properties of TE materials by increasing element species and forming high-entropy materials with severe lattice distortion.

3. P-type PbSe still shows a much lower zT value than PbTe, but high-entropy engineering can promote thermoelectric performance in p-type chalcogenides like Pb0.2Sn0.2Ge0.2PbS0.2Se0.2 by improving both electrical conductivity and thermal conductivity reduction through lattice distortion and structural stabilization.

# 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:

作为一篇科学论文，该文章并没有明显的偏见或宣传内容。然而，它可能存在一些片面报道和缺失的考虑点。

首先，文章只关注了提高热电材料的zT值来提高其转换效率，但并未探讨其他可能的方法来提高热电性能。例如，可以通过优化热电模块设计、改进制冷剂循环等方式来提高整个热电系统的效率。

其次，文章只关注了p型PbSe材料的zT值相对较低，并将其与PbTe进行比较。然而，这种比较可能不够全面和公正，因为还有其他类型的热电材料可供选择，并且每种材料都有其自身的优缺点。

此外，在介绍“熵工程”作为一种新颖策略时，文章没有探讨该策略是否存在潜在风险或限制。例如，在增加元素种类以增加混合熵时，可能会导致材料结构不稳定或难以制备。

最后，在介绍各种优化策略时，文章没有提供足够的证据来支持所述主张。例如，在讨论如何减少载流子有效质量和散射时，并未说明这些措施如何确切地影响电导率。

总之，虽然该文章并未明显偏袒任何一方或宣传特定观点，但仍存在一些片面报道和缺失考虑点。

# Topics for further research:

* Other methods to improve thermoelectric performance
* Comparison with other types of thermoelectric materials
* Potential risks or limitations of entropy engineering
* Evidence supporting optimization strategies
* Impact of measures to reduce carrier effective mass and scattering on conductivity
* Comprehensive and unbiased analysis of thermoelectric materials and strategies

# Report location:

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