

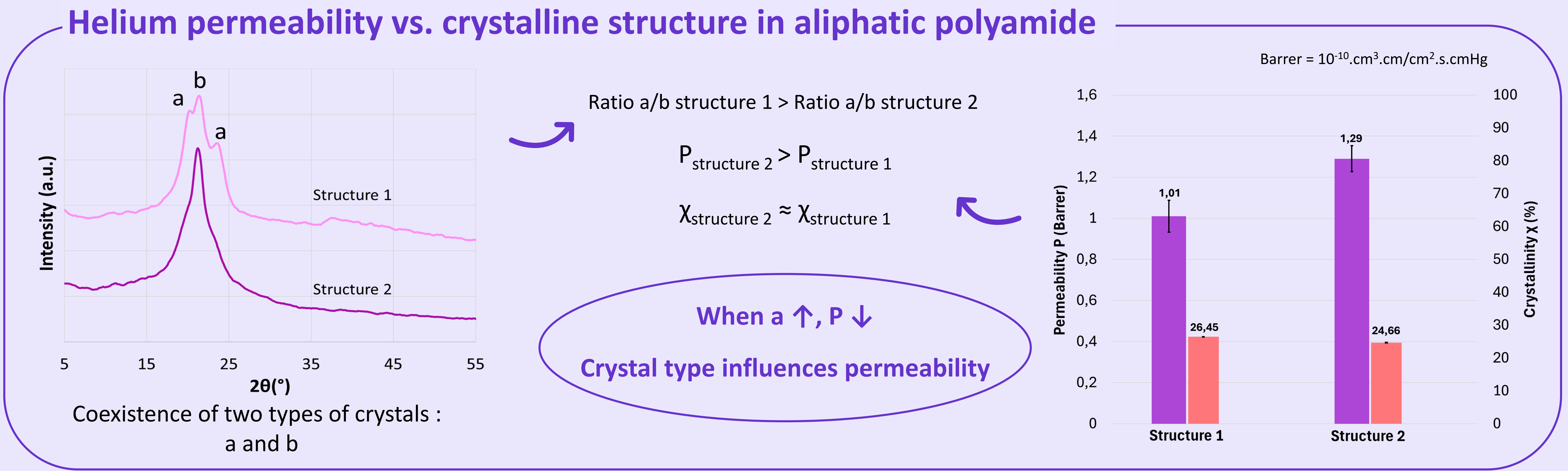
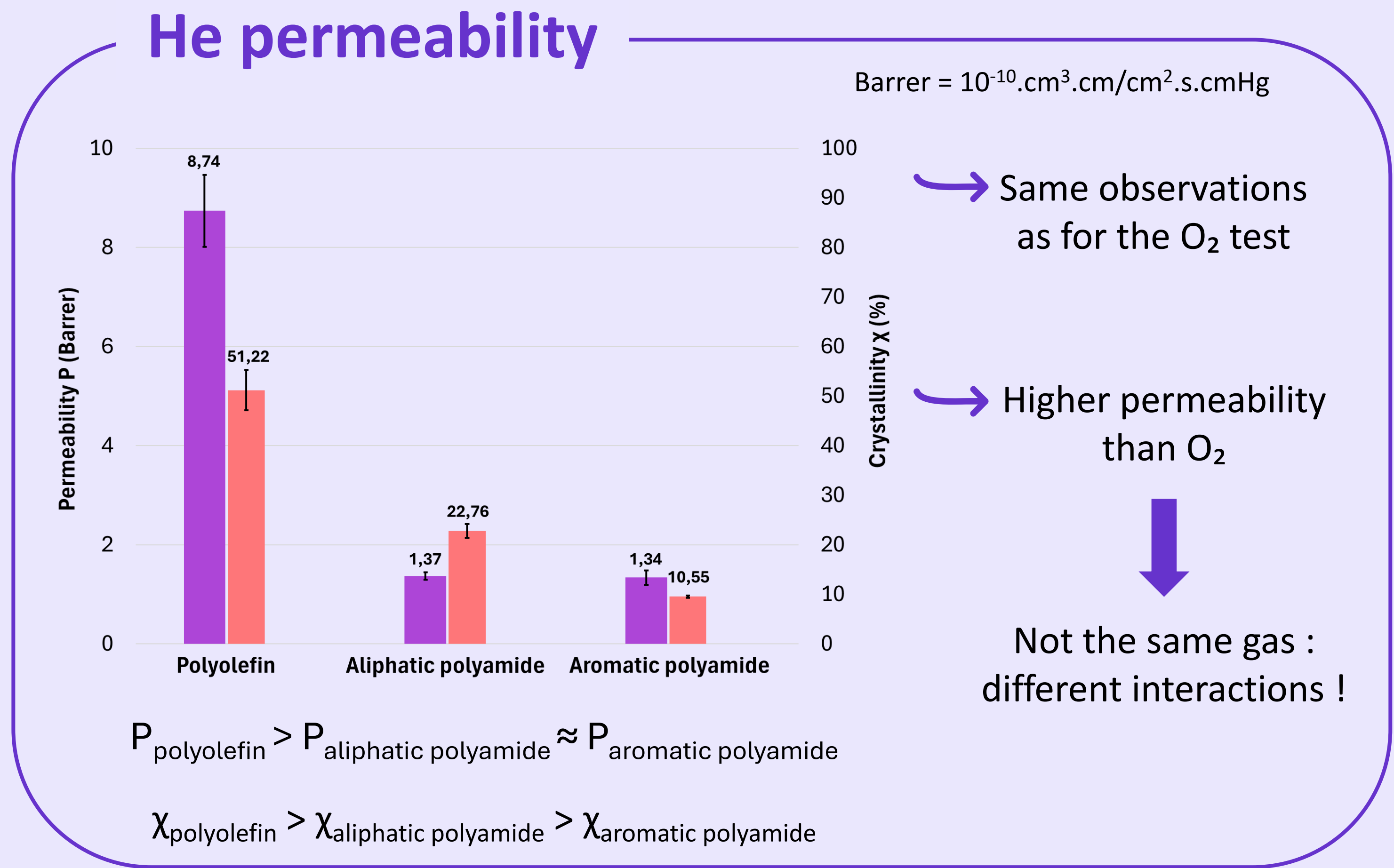
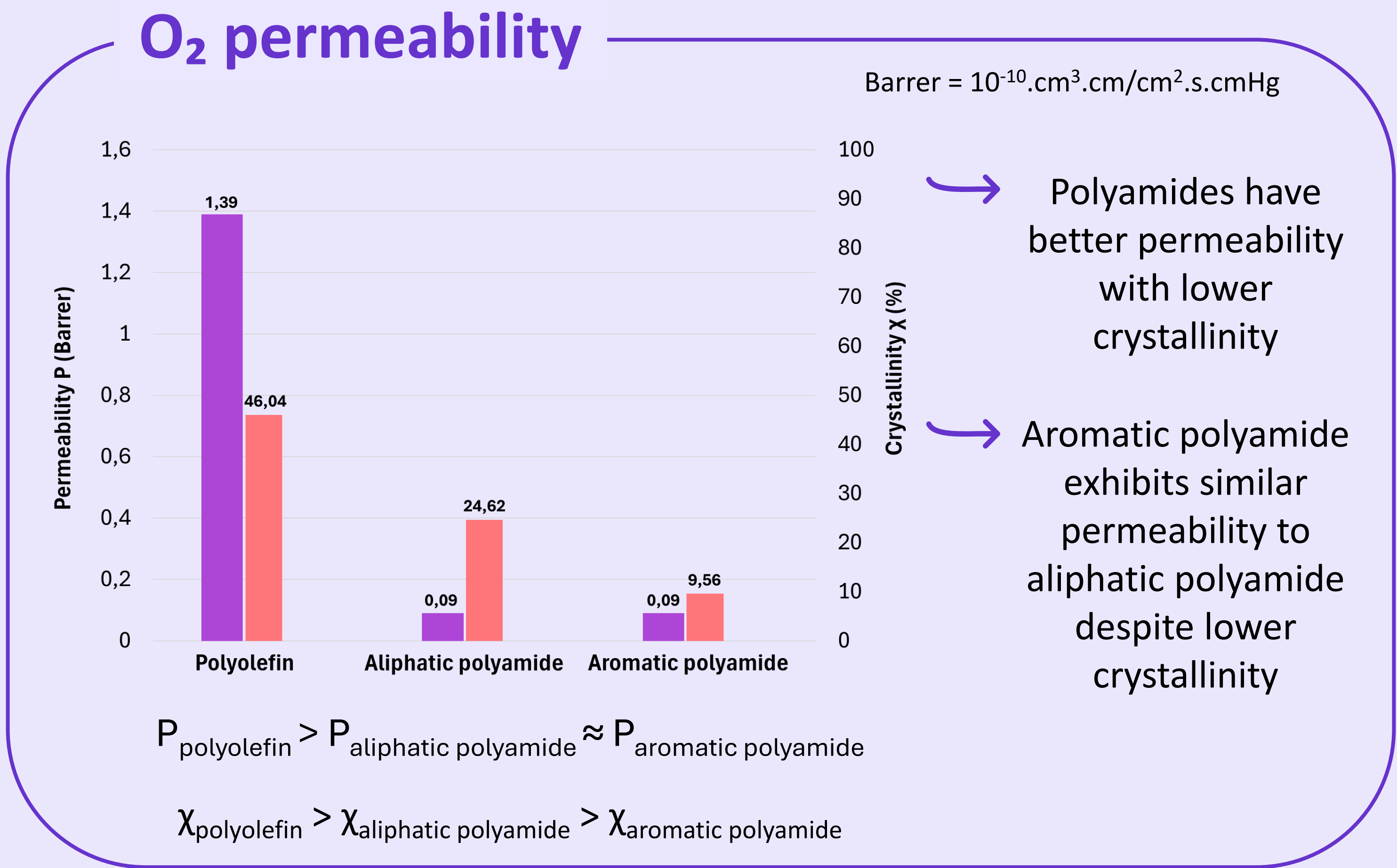
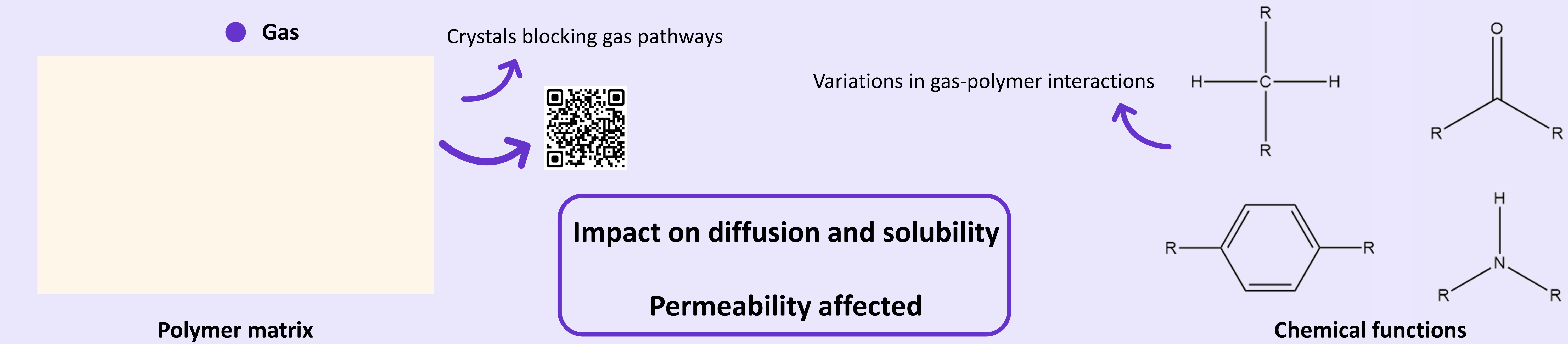
Polymers and gas permeability : A structural synergy

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Gas permeability (P) through polymer matrices can be defined as the product of two fundamental physical properties : diffusion (D) and solubility (S)¹⁻³. These two properties are strongly influenced by factors intrinsic to the materials, such as chemical structure and crystallinity (χ)⁴. Different chemical structures lead to variations in gas-polymer interactions depending on the functional groups present in the structure. As far as crystallinity is concerned, the higher the crystallinity of a specific polymer, the less the gas will diffuse through it⁵⁻⁶. Furthermore, since polymers can have several types of crystals, the dominance of one type over another also influences permeability⁷. The study of these effects is crucial for adjusting the permeability of materials to the specific needs of the desired applications. This study explores the relationship between the chemical structure, crystallinity and permeability of three polymers: a polyolefin, an aliphatic polyamide and an aromatic polyamide.



Conclusions

- The three polymers are more permeable to helium than to oxygen
- Polypropylene is more permeable than polyamides, despite its higher crystallinity
- O₂ and He permeability is comparable for both polyamides, though the aromatic is less crystalline
- In aliphatic polyamide, the predominant crystal type has an impact on permeability

➡ Preliminary study of the structure-properties relationships of three polymers

Acknowledgments

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