

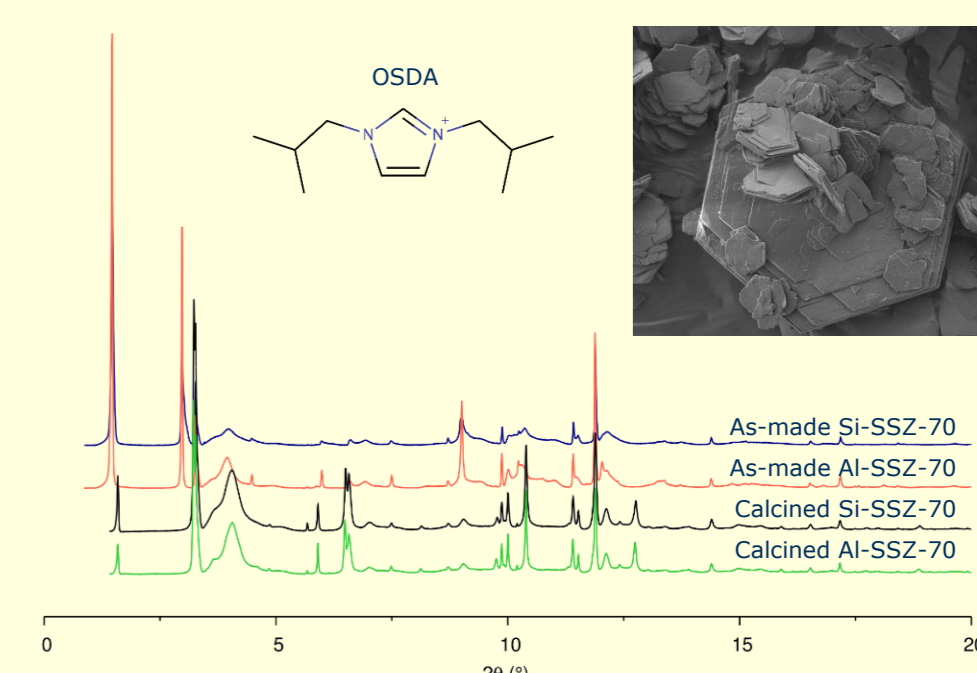
The structure of zeolite SSZ-70 through combined HRTEM, XRPD, and DNP-enhanced 2D NMR

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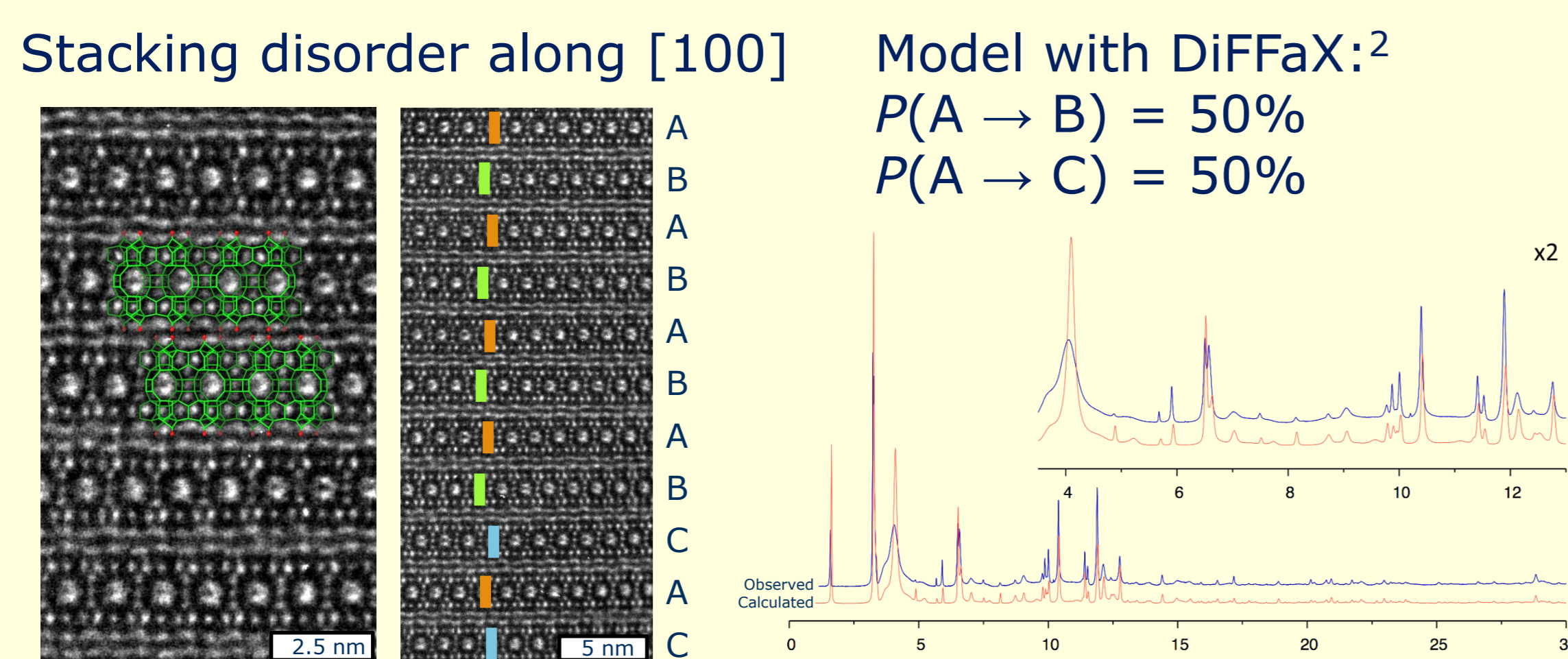
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Introduction

The synthesis of the borosilicate zeolite SSZ-70 was first reported over 10 years ago,¹ but its structure proved to be difficult to characterize. Only recently, through a combination of high-resolution X-ray powder diffraction (XRPD), high resolution transmission electron microscopy (HRTEM), and dynamic nuclear polarization (DNP) 2D NMR techniques, could the calcined form of SSZ-70 be determined.



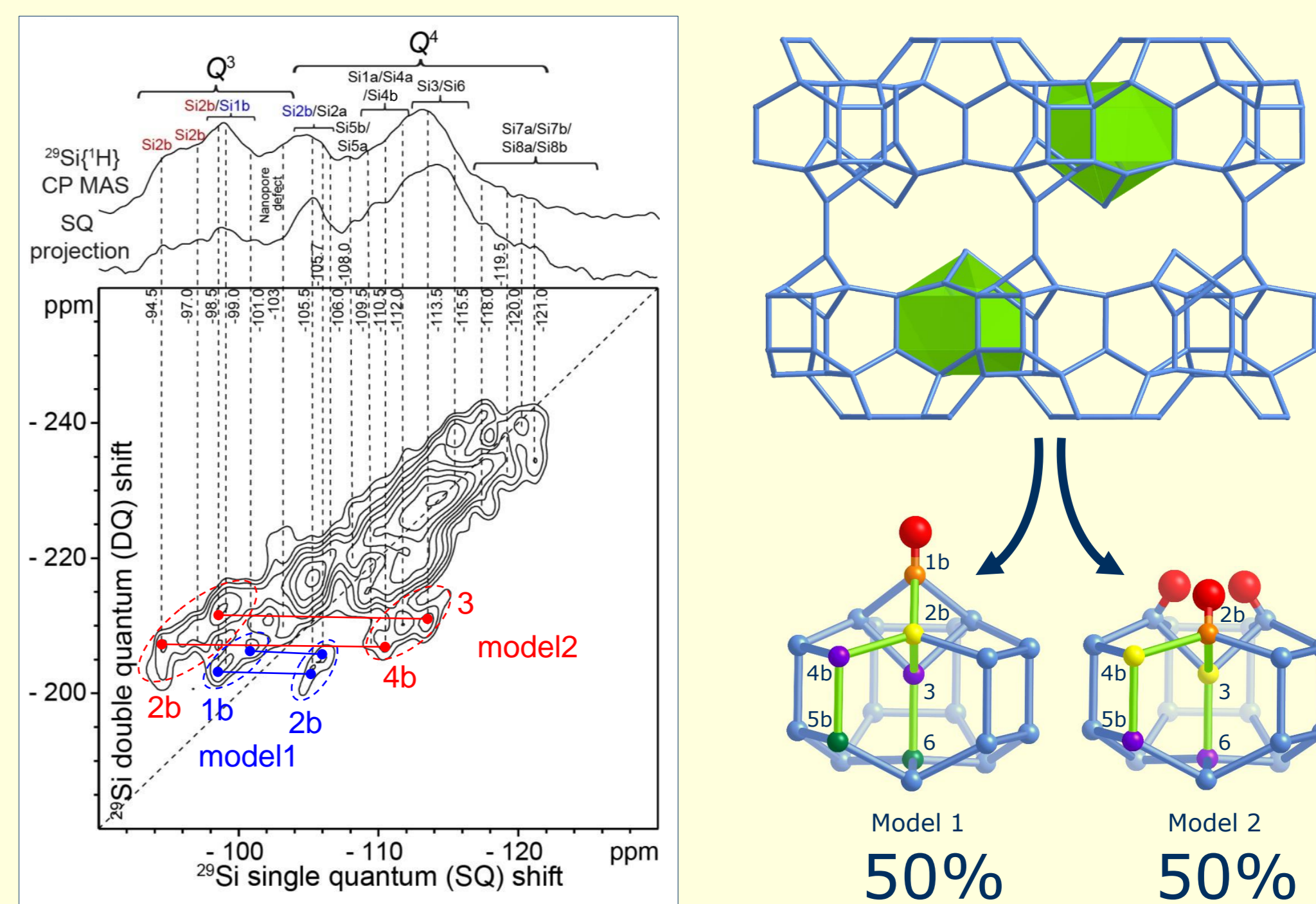
Disordered stacking of MWW-layers



HRTEM images show that SSZ-70 consists of disordered **MWW**-layers and XRPD data that the average structure consists of a random ABC-type stacking of such layers.

Two types of terminal silanol

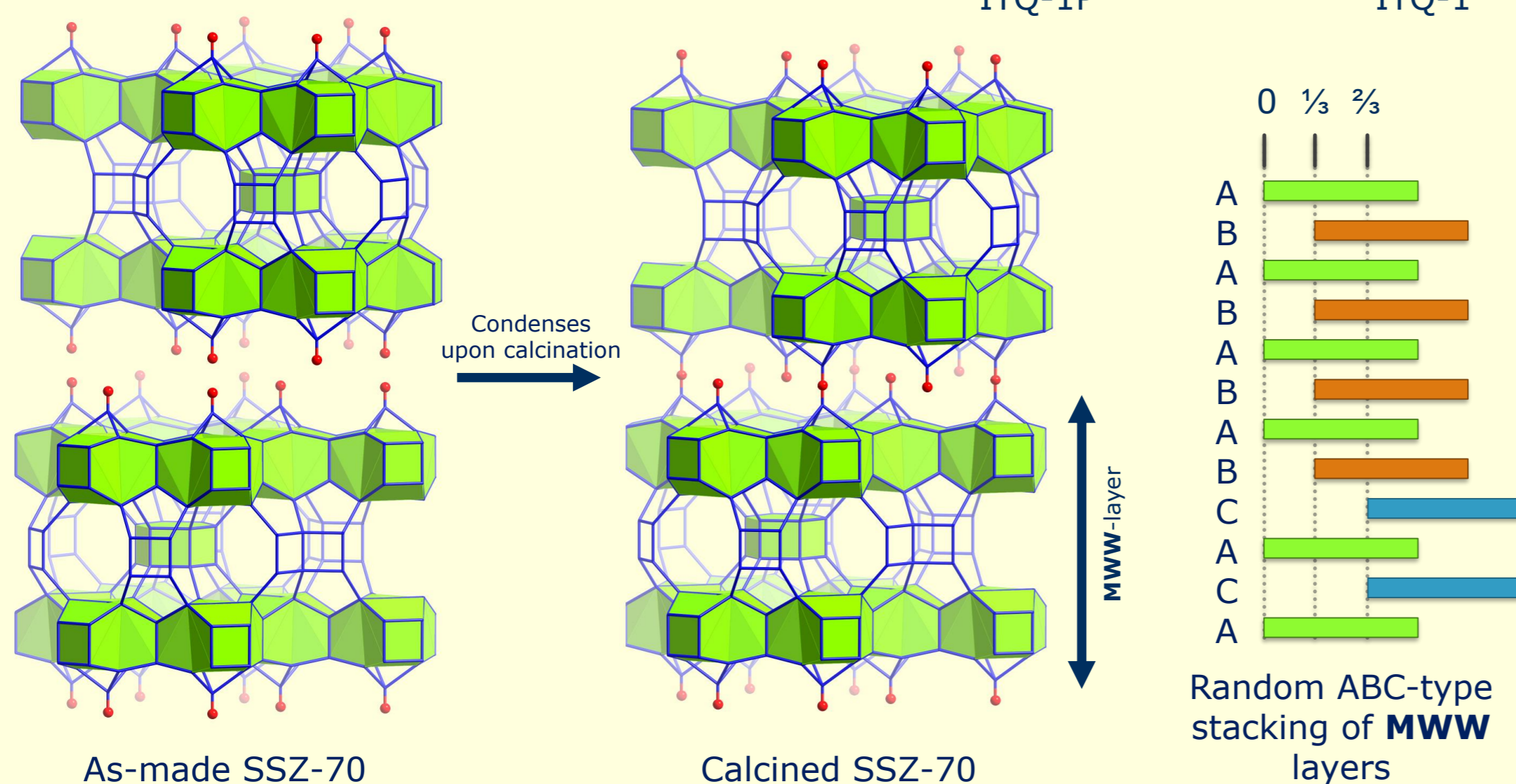
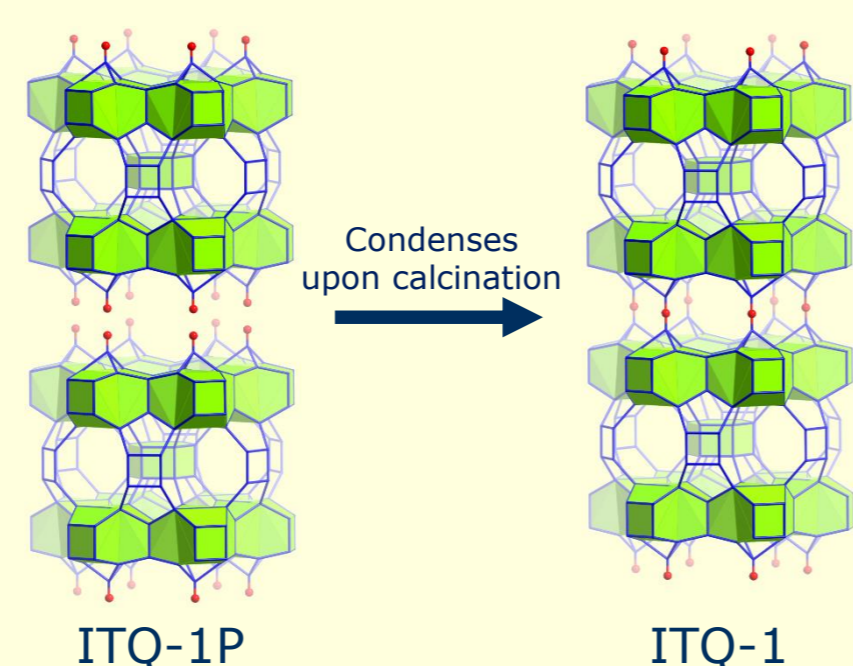
The combined sensitivity and resolution of the 2D DNP-enhanced ²⁹Si{²⁹Si} NMR analyses established that there are two types of terminal -SiOH groups at the interlayer surfaces.



SSZ-70 consists of a 50/50 mixture of both groups.

Relation to ITQ-1

Zeolite	Space group	a (Å)	c (Å)
ITQ-1P ¹	P6 ₃ /mmm	14.21	27.49
ITQ-1 (MWW) ²	P6 ₃ /mmm	14.21	24.94
SSZ-70 (as-made)	P6 ₃ /mmc	14.22	53.79
SSZ-70 (calcined)	P6 ₃ /mmc	14.23	49.81



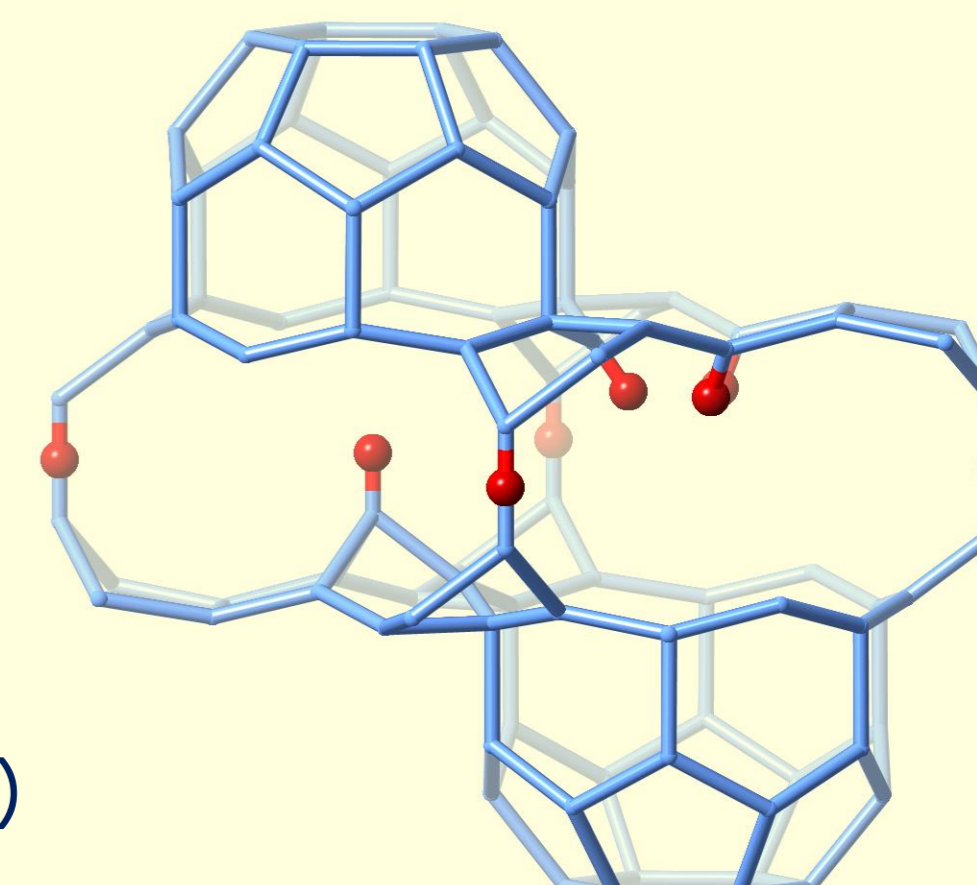
Conclusions

Structure of calcined SSZ-70 solved by combining methods:

- HRTEM → Stacking disorder
- XRPD → Average structure
- 2D NMR → Local structure

New stacking arrangement of **MWW**-layers

Open interlayer channel system with 14-ring pores (4.0 x 11.5 Å)



References

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