

# Material Solution toward Efficient Polysilicon Post-CMP Clean

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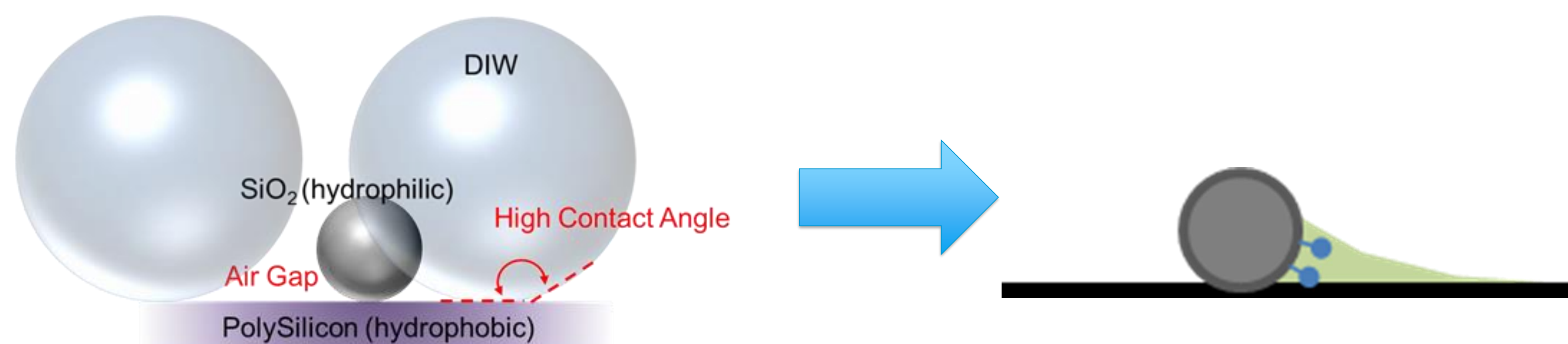
## 1. Introduction

Polycrystalline silicon is a material important in various applications, such as polysilicon contacts, capacitors, gates and floating gates. In these applications, chemical mechanical planarization (CMP) is utilized to achieve surface smoothing and/or global planarization for subsequent manufacturing. In general, the surface of polysilicon is predominately hydrogen-terminated and hydrophobic after CMP processing. Owing to the incompatibility with the surface, it is difficult to remove abrasive particles from the polished surface in the post-CMP (PCMP) cleaning process using a standard aqueous-based cleaner.

## 2. Fundamentals

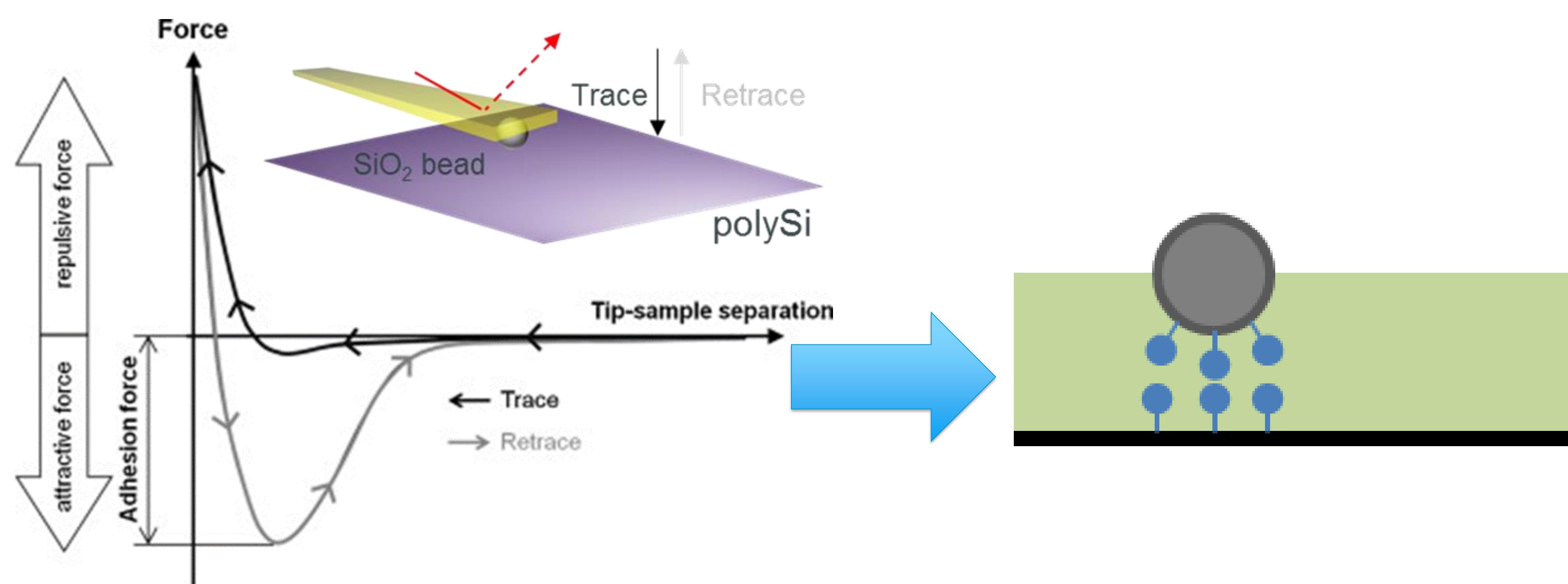
(i) Excellent wetting capability enables characteristics:

- “Flowability” to penetrate the interface between polySi surface and abrasive
- Improved organic residue removal



(ii) Impacts of particle-polySi interaction can be derived from:

- Adhesion force of abrasive to polySi surface
- Electrostatic passivation/attraction (surface charge)



## 3. Results

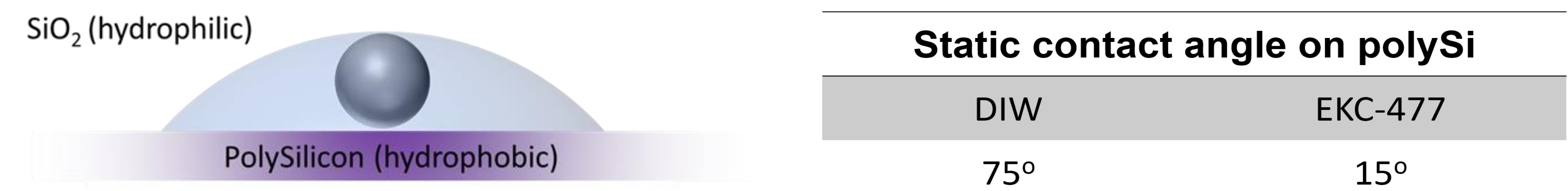


Figure 1. Enhanced wetting capability of EKC PCMP477 over DIW.

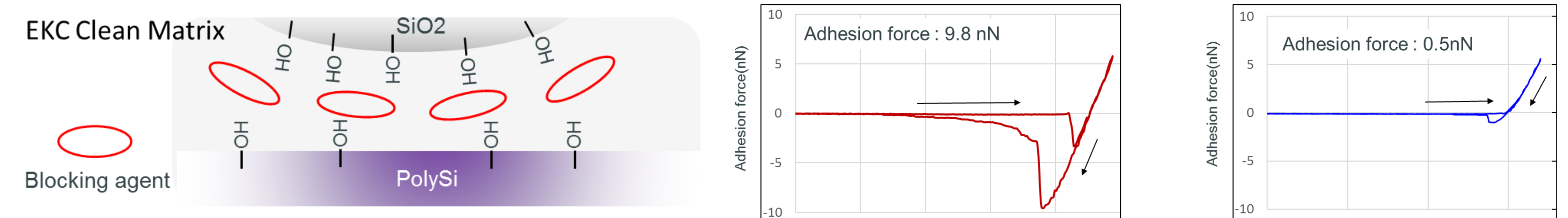
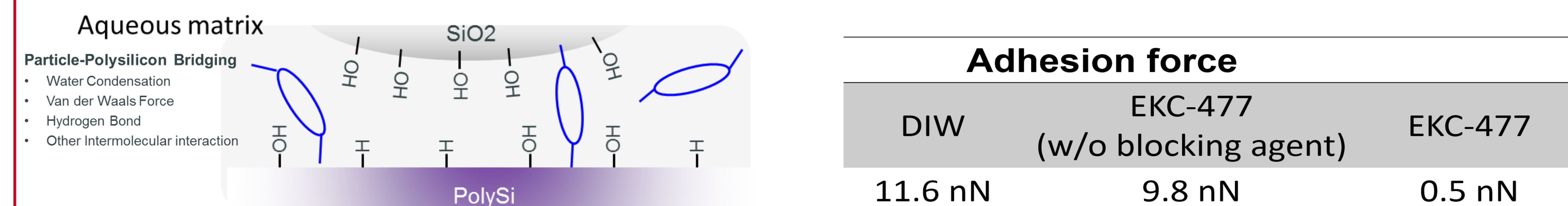


Figure 2. EKC PCMP477 with blocking agent gives better particle inhibition capability during post-CMP cleaning process.

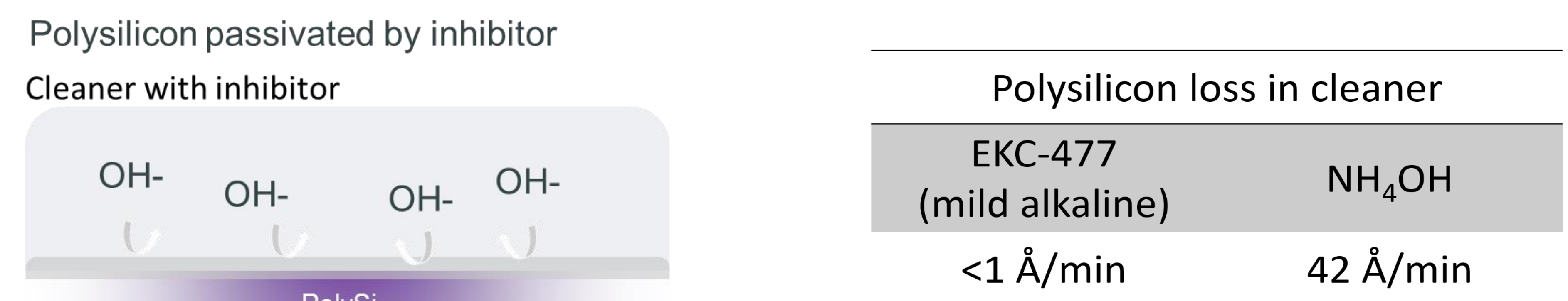


Figure 3. EKC PCMP477 provides comprehensive polysilicon protection during post-CMP cleaning process.

## 4. Conclusions and Future Applications

Currently, the cleaning process for polysilicon CMP is predominantly done by alkaline commodity chemicals such as NH<sub>4</sub>OH or SC1. As demonstrated by our in-house study, these chemicals can only enable electrostatic passivation (repulsion) between the abrasive particles and the polysilicon surface. Alternatively, through formulation design, our EKC formulated cleaners can easily reach the criteria listed above and outperform the commodity chemistry in practical PCMP cleaning.