

# Advancing Green Chemical Catalysis: The Role of Pillared Interlayered Clays

Komal Patil<sup>1</sup>, Pratibha Mhatre<sup>2</sup>, Anushka Mhatre<sup>3</sup>, Gurumeet C. Wadhava<sup>4</sup>,  
Smita M. Tandale<sup>5</sup>, Sajid F. Shaikh<sup>6</sup>, Amod N. Thakkar<sup>7</sup>

Students P.G. Department of Chemistry, Veer Wajekar College Phunde, Uran<sup>1,2,3</sup>

Assistant Professor Department of Chemistry, Veer Wajekar College Phunde, Uran<sup>4</sup>

Vice Principal and Head Department of Chemistry, Veer Wajekar ASC College, Phunde, Uran<sup>5</sup>

Department of Chemistry, Anjuman Islam Janjira Degree College of Science, Murud Janjira, Raigad<sup>6</sup>

Principal, Veer Wajekar ASC College, Phunde, Uran<sup>7</sup>

**Abstract:** Pillared Interlayered Clays (PILCs) have gained significant attention in recent years due to their versatile applications, particularly in adsorption and catalysis. These advanced materials leverage the unique nanostructure of clay minerals, offering tailored interlayers and active sites for catalytic processes. The strategic modification of clays has led to the development of various catalytic systems, including ion-exchanged catalysts, acid-activated clays, intercalated and pillared catalysts, as well as hybrid organic-inorganic and hierarchically structured catalysts. Their effectiveness in green chemical catalysis is attributed to their high surface area, tunable acidity, and thermal stability. This review highlights the role of PILCs in sustainable catalytic applications, emphasizing their significance in eco-friendly and efficient reaction pathways.

**Keywords:** Pillared Interlayered Clays, Green Catalysis, Heterogeneous Catalysts, Montmorillonite, Chromium-Pillared Clays, Iron-Pillared Clays, Zirconium-Pillared Clays, Adsorption, Environmental Catalysis

