Supplemental Section:

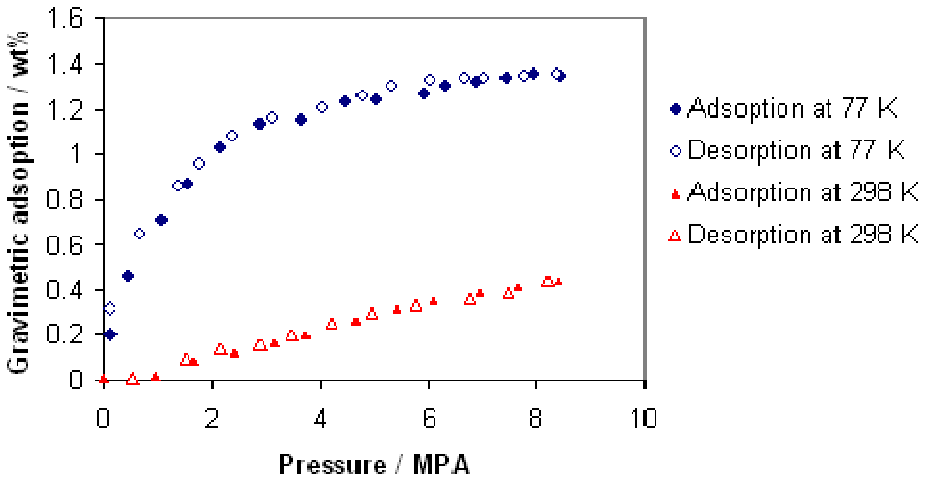

Figure S1: Hydrogen adsorption and desorption isotherms at 77K and at 298K for plain silica (HMS).

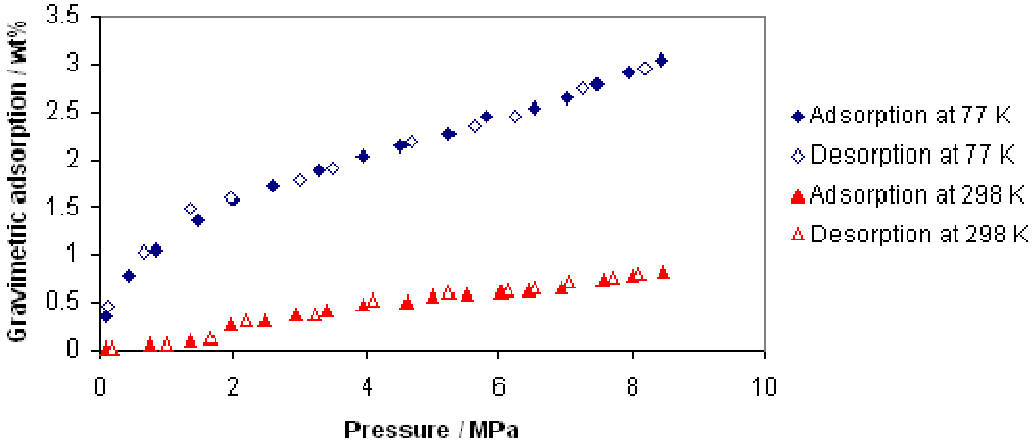

Figure S2: Hydrogen adsorption and desorption isotherms at 77K and at 298K for tetra(benzyl)Ti-HMS.

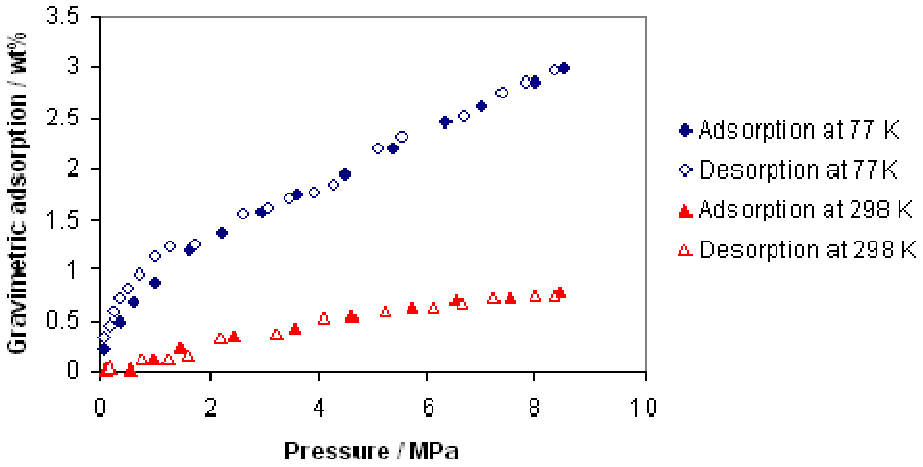

Figure S3: Hydrogen adsorption and desorption isotherms at 77K and at 298K for bis(naphthalene)Ti-HMS.

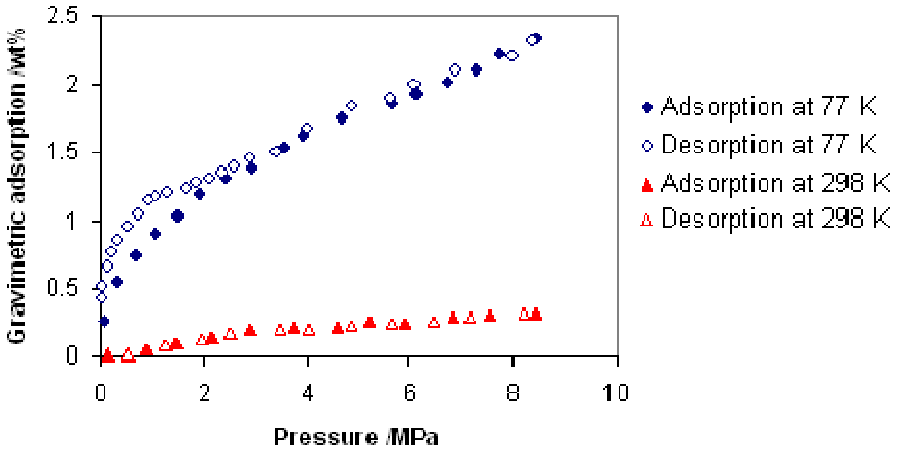

Figure S4: Hydrogen adsorption and desorption isotherms at 77K and at 298K for tris(mesityl)V-HMS before hydrogenation.

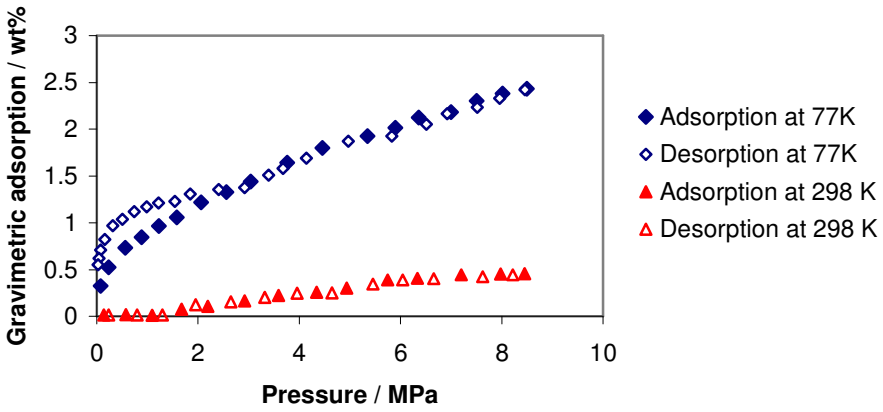

Figure S5: Hydrogen adsorption and desorption isotherms at 77K and at 298K for tris(mesityl)V-HMS after hydrogenation.

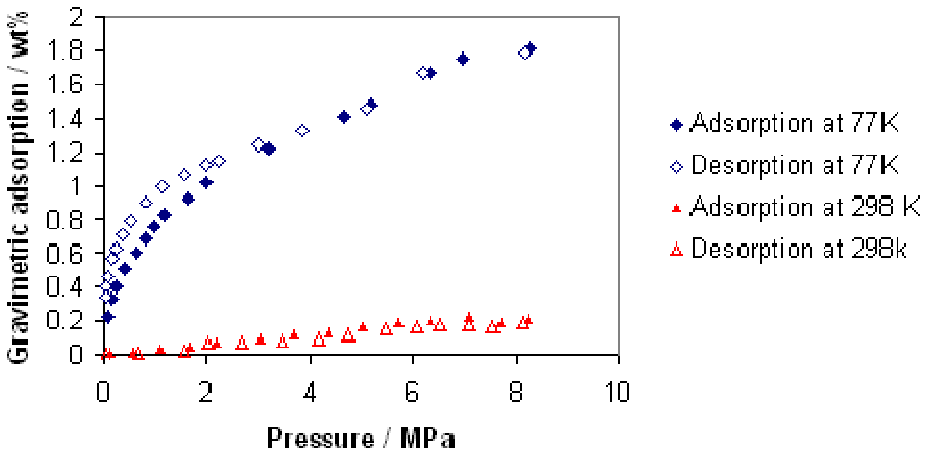

Figure S6: Hydrogen adsorption and desorption isotherms at 77K and at 298K for tris[bis(trimethylsilyl)methyl]Cr-HMS before hydrogenation.

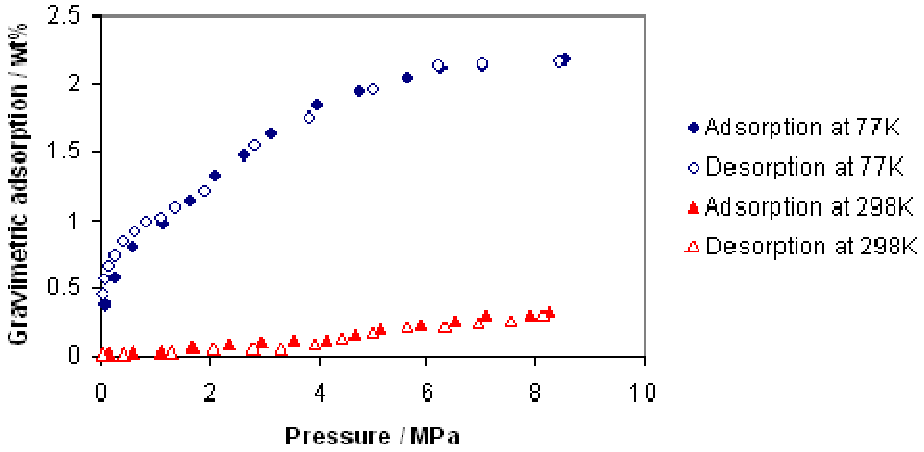

Figure S7: Hydrogen adsorption and desorption isotherms at 77K and at 298K for tris[bis(trimethylsilyl)methyl]Cr-HMS after hydrogenation.

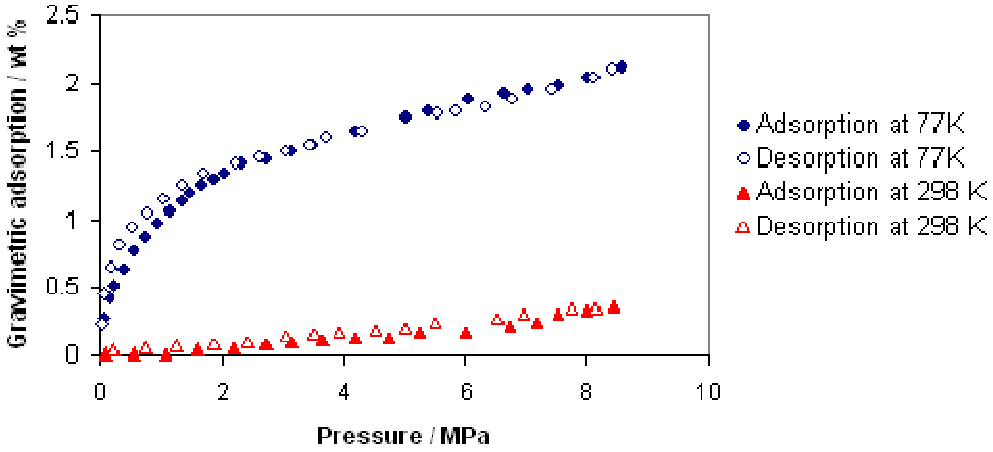

Figure S8: Hydrogen adsorption and desorption isotherms at 77K and at 298K for bis[(trimethylsilyl)methyl]Cr-HMS before hydrogenation.

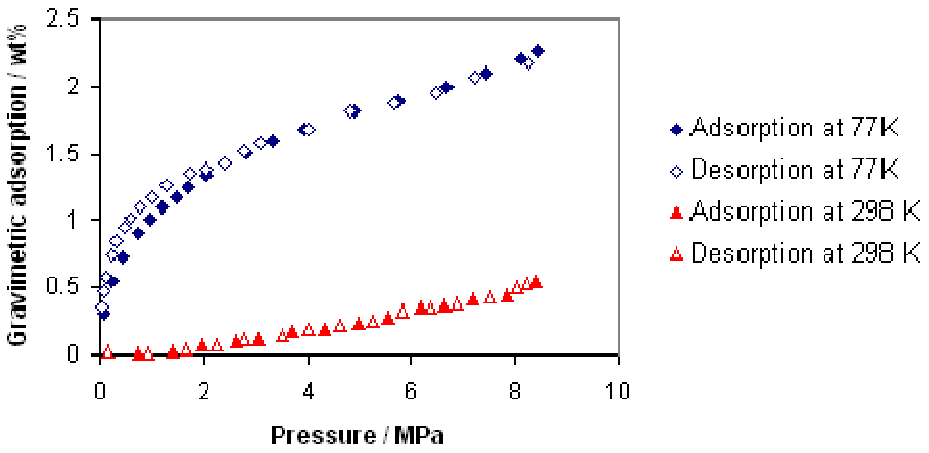

Figure S9: Hydrogen adsorption and desorption isotherms at 77K and at 298K for bis[(trimethylsilyl)methyl]Cr-HMS after hydrogenation.