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**Connected sums, minimal models and related topics of 4-manifolds and Poincaré duality spaces**

*Abstract.* In the preprint I. Hambleton, M. Kreck, P. Teichner, *Topological 4-manifolds with geometrically 2-dimensional fundamental group*, (arXiv mathGT 7.2.2008), the authors introduce the concept of minimal (closed, oriented) 4-manifolds (Poincaré complexes). This is closely related to splitting of a 4-manifold  $M$  (or Poincaré complex) as a connected sum of  $P$  and a simply-connected 4-manifold  $M'$  (cf. F. Hegenbarth, D. Repovš, F. Spaggiari, *Connected sums of 4-manifolds*, *Topology Appl.* **146-147** (2005), 209–225). A minimal 4-manifold (Poincaré complex) cannot be decomposed in such a way with  $M'$  different from the 4-sphere. A basic problem is to find, for a given  $M$ , a decomposition with  $P$  minimal. We can apply our method to obtain solutions of this problem, in particular, we can reprove some of the results of Hambleton-Kreck-Teichner. A basic ingredient is the equivariant intersection form of 2-dimensional homology classes. Details will be explained in the lecture.