The complement of a connected bipartite graph is vertex decomposable

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Abstract

Associated to a simple undirected graph $G$ is a simplicial complex $\Delta_G$ whose faces correspond to the independent sets of $G$. A graph $G$ is called vertex decomposable if $\Delta_G$ is a vertex decomposable simplicial complex. We are interested in determining what families of graph have the property that the complement of $G$, denoted by $\overline{G}$, is vertex decomposable. We obtain the result that the complement of a connected bipartite graph is vertex decomposable and so it is Cohen-Macaulay due to pureness of $\Delta_{\overline{G}}$. 