Bahri, A.; Bendersky, M.; Cohen, F. R.; Gitler, S.
Cup-products for the polyhedral product functor. (English) Zbl 1258.13027

The polyhedral product functor, or generalized moment-angle complex, was introduced in a previous paper by the same authors [Adv. Math. 225, No. 3, 1634–1668 (2010; Zbl 1197.13021)]: associated to an abstract simplicial complex $K$ with $m$ vertices, whose simplices $\sigma$ are identified with subsequences of $(1,\ldots, m)$, and a family $(X, A) = \{(X_i, A_i)\}_{i=1}^m$ of based CW pairs, they defined the space

$$Z(K,(X, A)) = \bigcup_{\sigma \in K} D(\sigma),$$

where $D(\sigma) = \prod_{i=1}^m Y_i$, and $Y_i = X_i$ if $i \in \sigma$ and $Y_i = A_i$ if $i \notin \sigma$. In the case $(X_i, A_i) = (D^2, S^1)$, the ordinary moment-angle complexes are recovered.

The main object of interest in [loc. cit.] was the stable homotopy type of $Z(K,(X, A))$; among others, the authors proved a decomposition theorem for the first suspension of this space: it is homotopy equivalent to the suspension of a wedge sum of some generalized smash moment-angle complexes determined by the full subcomplexes of $K$. In this paper, they use this decomposition theorem to investigate the ring structure of the cohomology of $Z(K,(X, A))$. They show that it is isomorphic to the sum of the cohomologies of the generalizes smash moment-angle complexes appearing in the wedge sum mentioned above, equipped with a natural product (called $\ast$-product). This is used to find some conditions under which the product of two cohomology classes is zero, and to generalize some results from [loc. cit.] for the case that the $A_i$ are contractible.

Reviewer: Oliver Goertsches (Hamburg)

MSC:
13F55 Commutative rings defined by monomial ideals; Stanley-Reisner face rings; simplicial complexes
14F45 Topological properties in algebraic geometry
55U10 Simplicial sets and complexes in algebraic topology

Keywords:
moment-angle complex; simplicial complex; cohomology ring; suspension; stable homotopy type; Stanley-Reisner ring

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