

Up until now, I have been researching commutative ring theory, focusing on combinatorial aspects. Characterized the Buchsbaum property of Stanley-Reisner rings and defined the notion of doubly Buchsbaum property. Stanley-Reisner ring is also defined from a poset, so I considered ordered sets in that relationship and interested in the relationship between posets and commutative ring theory. Therefore, I shifted my research focus to algebra with straightening law (ASL), especially rings defined by the vanishing of given minors of given matrices (determinant rings). I have obtained several results regarding ASL structure.

Around that time, professor Sakata of Kyushu University (who has now passed away) invited me to work with him and professor Sumi of Kyushu University. We began joint research on so called tensors, high-dimensional version of matrices, especially research related to their ranks. In this, the above knowledge of determinant rings plays an important role, and the relationship between commutative ring theory and tensor theory has also been revealed.

On the other hand, I also studied Hibi rings, which is particularly widely used ASL, and investigated their canonical modules. I succeeded in describing the generator of the canonical module by the combinatorial structure of posets that define the Hibi ring and characterized the level property of Hibi rings. Furthermore, I showed that its generators are arranged in such a way that it forms a toric face ring.

A Hibi ring is the Ehrhart ring of the convex polytope called the order polytope, defined by Stanley, of the poset defining the Hibi ring. Stanley defined two convex polytopes, called the order polytope and the chain polytope, from a poset and discussed the similarity of them. Therefore, I studied the similarity of the properties of Hibi ring, that is, the Ehrhart ring of order polytope, and the properties of Ehrhart ring of chain polytope. In particular, I showed that if the Ehrhart ring of chain polytope is level, then the Ehrhart ring of order polytope is also a level, but the converse does not hold in general. Furthermore, since chain polytope is a stable set polytope of the comparability graph of the poset that defines it, I studied the Ehrhart ring of the stable set polytopes of graphs and obtained some results.