

On the spectral radius of atom-bond maximum degree-based sum-connectivity matrix.

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Abstract

In mathematical chemistry, several well-known degree-based graph invariants and their corresponding matrices have been extensively studied. One of the modified versions of Randić index is the index $R'(G) = \sum_{v_i \sim v_j} \frac{1}{\max\{d_i, d_j\}}$, where d_i and d_j are the vertex degrees of v_i and v_j , respectively. The *ABS* index of a graph G is defined as $\sum_{v_i \sim v_j} \sqrt{1 - \frac{2}{d_i + d_j}}$, introduced as an amalgamation of the sum-connectivity index $S(G) = \sum_{v_i \sim v_j} \frac{1}{\sqrt{d_i + d_j}}$ and the *ABC* index $\sum_{v_i \sim v_j} \sqrt{\frac{d_i + d_j - 2}{d_i d_j}}$. Motivated by the studies on both the *ABC* and *ABS* indices, we introduce in this paper a variant of the *ABS* index, called atom-bond maximum degree-based sum-connectivity index (abbreviated as *ABS_{max}* index) defined by $ABS_{max}(G) = \sum_{v_i \sim v_j} \sqrt{1 - \frac{1}{\max\{d_i, d_j\}}}$. It combines the indices $R'(G)$ and $ABS(G)$. We then define *ABS_{max}* matrix, a topological matrix based on this index and investigate its spectral radius for trees and unicyclic graphs. In particular, we identify the first five largest *ABS_{max}* spectral radii of trees, and determine the first four largest *ABS_{max}* spectral radii of unicyclic graphs. It is worth noting that the *ABS_{max}* matrix does not fall under the unified approaches for studying the spectral radius of trees and unicyclic graphs with respect to topological matrices.

Keywords: *ABS*-index, *ABS_{max}*-index, spectral radius.
