Suppose $m \leq n$, and let L denote the maximum length of any string in $A \cup B$. Suppose there is a string that is a concatenation over both A and B, and let u be one of minimum length. We claim that the length of u is at most n^2L^2.

For suppose not. First, we say that position p in u is of *type* (a_i, k) if in the concatenation over A, it is represented by position k of string a_i. We define *type* (b_i, k) analogously. Now, if the length of u is greater than n^2L^2, then by the pigeonhole principle, there exist positions p and p' in u, $p < p'$, so that both are of type (a_i, k) and (b_j, k) for some indices i, j, k. But in this case, the string u' obtained by deleting positions $p, p+1, \ldots, p'-1$ would also be a concatenation over both A and B. As u' is shorter than u, this is a contradiction.

[1] ex690.144.299