Step-1

Suppose, $(Q_0Q_1...Q_{k-1})(R_{k-1}...R_1R_0)$ is the *QR* factorization of A_k.

We know that $A_{k+1} = R_kQ_k$

Therefore,

$$A_{k+1}Q_k^{-1} = R_kQ_kQ_k^{-1}$$
$$A_{k+1}Q_k^{T} = R_k$$

Thus, $R_k = \left(Q_k^T...Q_0^TAQ_0...Q_k\right)Q_k^T$.

Step-2

This gives

$$\begin{aligned} R_k\left(R_{k-1}...R_0\right) &= \left(Q_k^T...Q_0^TAQ_0...Q_k\right)Q_k^T\left(R_{k-1}...R_0\right) \\ &= Q_k^T...Q_0^TA_{k+1} \end{aligned}$$

Therefore, $A_{k+1} = \left(Q_0Q_1...Q_k\right)\left(R_k...R_1R_0\right)$.