Initial:

$$M_{org} = c_{o,f} V_o$$

Final ($D_2 = \frac{c_{o,f2}}{c_{A2,f}}$):

$$M_{org} = c_{A2,f} V_{A2} + c_{o,f2} V_o$$

Solving for $c_{A2,f}$ in terms of D_2:

$$c_{A2,f} = \frac{M_{org}}{V_{A2} + D_2 V_o}$$

Solving for $\frac{c_{A,i}}{c_{A2,f}}$ (note: $c_{A,i}$ is from the *initial* aqueous phase):

$$\frac{c_{A,i}}{c_{A2,f}} = \frac{1}{f_o} \frac{V_{A2} + D_2 V_o}{V_A}$$