Answer to Question #61973, Chemistry / Other

Find proportions of each ingredient including the amount of water you must start with.

$Ca(NO_3)_2$-SiO_2 composite gel electrolyte was prepared with a sol-gel method, $Ca(NO_3)_2$ aqueous solution was firstly prepared by adding $Ca(NO_3)_2{\cdot}4H_2O$ in deionized water. Then 90%wt of 2 M $Ca(NO_3)_2$ solution, 10wt% of SiO_2 powder (as gelating agent) and 1wt% carboxymethylcellulose

Answer:
Supose you need 101 g of final gel. You need 1 g of carboxymethylcellulose, 10 g of SiO_2 powder and 90 g of 2 M $Ca(NO_3)_2$ solution. Supose its density approx. 1 g/ml. So

$$n(\mathrm{Ca(NO_3)_2}) = \frac{2\frac{\mathrm{mol}}{\mathrm{L}} \times 90\ \mathrm{g}}{1000\frac{g}{L}} = 0.18\,mol$$

Since

$$n(\mathrm{Ca(NO_3)_2}) = n(\mathrm{Ca(NO_3)_2} \times 4H_2O) = 0.18\,mol$$

So

$$m(\mathrm{Ca(NO_3)_2} \times 4H_2O) = 0.18\,mol \times 236.149\frac{g}{mol} = 42.5\ g$$

Thus, mass of water to prepare solution:

$$m = 90\ g - 42.5\ g = 47.5\ g$$

Answer:
Proportions are:

carboxymethylcellulose	1
SiO_2 powder	10
$Ca(NO_3)_2{\cdot}4H_2O$	42.5
deionized water	47.5